ST. LAWRENCE
REMEDIAL ACTION PLAN

PLAN D'ASSAINISSEMENT
ST-LAURENT

Addendum to Stage 1 Report

St. Lawrence River Remedial Action Plan
Cornwall/Lake St. Francis Area

February 1995

Remedial Action Plan
Plan d'Assainissement

Canada Ontario

Addendum *(1988-1992)* to the Stage 1 Report on the St. Lawrence River Remedial Action Plan (Cornwall/Lake St. Francis area)

St. Lawrence River (Cornwall) RAP Team

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for St. Lawrence RAP Team

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1.0 INTRODUCTION

1.1 How to Use this Addendum

The *Stage 1 Report of the St. Lawrence River (Cornwall) Remedial Action Plan* (RAP) — hereafter referred to as the Stage 1 Report — documented environmental conditions, problems and their sources in the AOC up to and including 1988. The *Addendum to the Stage 1 Report* is a compilation of data and information obtained from the time of writing the Stage 1 Report up to 1992.

Because of the time lag between the writing of this Addendum and release of the final version, a substantial amount of additional data has been collected that is not reported here. Information obtained since 1992 will be included in the Stage 2 Report of the St. Lawrence River (Cornwall) RAP.

Please note:
This Addendum is written in a format that requires it be used in conjunction with the Stage 1 Report. The list below indicates all page numbers in the Stage 1 Report to which changes or additions have been made and indicates the corresponding Addendum page number on which each change or addition can be found.

The Addendum is organized so that it corresponds to the chapters of the St. Lawrence RAP Stage 1 Report. Two separate numbering systems are used for the tables and figures in the Addendum:
(1) Tables and figures from the Stage 1 Report that have been updated, retain the number they had in the original Stage 1 Report. These are dashed numbers (*e.g.*, Figure 5-2, Table 1-1), the first number of which indicates a chapter number in the Stage 1 Report;
(2) New tables and figures presented for the first time here, are numbered 1, 2, 3...etc.

Where appropriate, updated information has been compared with information given in the Stage 1 Report (*e.g.*, 1987 pre-MISA monitoring data is compared with 1990 MISA data). New sections containing results of new surveys (*e.g.*, 1990 and 1991 zebra mussel survey) have been added to the appropriate Stage 1 Report chapter. Additions and changes to existing tables are indicated by shadowing.

An updated map of the St. Lawrence Area of Concern is provided in Figure 5.

1.2 List of Changes and Additions to St. Lawrence RAP Stage 1 Report

Corrections or additions have been made to the following page numbers in *St. Lawrence RAP Stage 1: Environmental Conditions and Problem Definitions (August 1992)*. The updated information can be found in this Addendum on the page number indicated below:

Page # in *Stage 1: Environmental Conditions and Problem Definition (August 1992)*	Correction/addition found on following page # in *Addendum to the Stage 1 Report (June 1994)*
1-3, para. 3	3
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(cont'd)

Page # in *Stage 1: Environmental Conditions and Problem Definition (August 1992)*	Correction/addition found on following page # in *Addendum to the Stage 1 Report (June 1994)*
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6-60, para. 1	8
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6-7 (Section 6.1.2 has been updated)	10
6-27 (Section 6.2.1 has been updated)	13
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6-37 (new Section 6.2.2.5 added)	16
6-47 (Section 6.3.4.1 has been updated)	22
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7-17, para. 1	33
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2.0 ADDENDUM TO CHAPTER 1: Summary of Environmental Problems and Concerns

2.1 Wildlife

Page 1-3, third paragraph, add: "Available data indicate that lead is present in the sediments and lead shot is certainly also present, but there are no data to indicate the relative contribution of each to tissue levels of lead in waterfowl. It is also difficult to determine whether lead contamination is due to either contaminated effluent or ingestion of lead shot in the AOC, since only fall collections were analyzed for metals. Lead contamination of birds collected during the fall migration should not be assumed to be caused by sources in the AOC, since the collection would include both local birds and migrants that had been feeding outside the AOC. Only a summer collection of juveniles would accurately reflect the levels of contaminants originating in the AOC."

2.2 Update of Table 1-1

Table 1-1. Summary of Environmental Problems and Sources (changes and additions indicated by shadowing)

Environmental Problem	Current Conditions	Impaired Uses	Sources of Problem	Current Information Deficiencies
heavy metals and toxic organic compounds in fish and wildlife species	contaminant levels exceed Health and Welfare Canada's consumption guidelines for mercury (0.5 ppm) and PCBs (2.0 ppm)	fish consumption by humans	Industrial sources [ICI (formerly CIL), Courtaulds (closed 1992)]; sediment (mercury); Massena sources (PCBs); upstream loadings	
	PCB levels in young-of-the-year fish exceed the IJC guideline (0.1 ppm) for the protection of wildlife that consume fish	fish and wildlife health	Massena sources	
	PCB levels in waterfowl (local and staging) are high	waterfowl consumption	Massena sources	no health data available
fish population decline	historical impacts of Seaway and dams on whole fish community has resulted in some species declines (now stable)	fish reproduction and consumption	heavy fishing pressure, habitat loss (historically Seaway and dam construction; now shoreline development; zebra mussel impact expected in future)	
bacteria	bacterial densities exceed provincial requirements for safe swimming on occasion	swimming/body contact recreation	CSOs, cottage septic systems	study underway to determine concentration gradient and relative impacts of discharges

Table 1-1 (Cont'd)

Environmental Problem	Current Conditions	Impaired Uses	Sources of Problem	Current Information Deficiencies
nuisance aquatic weed growth	Lake St. Francis has extensive beds of submergent and emergent aquatic vegetation; algal growth excessive in some summers	boating (nearshore access)	reduction in flow and velocity due primarily to Seaway & dam construction and continued nutrient inputs; algal growth probably due to climate conditions	
metals, oils & grease and toxic organic compounds in sediments	sediments from some locations exceed provincial open water disposal guidelines; contaminant uptake documented in benthic invertebrates	open water disposal of sediments dredged for navigational purposes	historic and ongoing discharges and spills from municipal and industrial sources from both Canada and the United States, spills from ships a potential source	significance of sediment contaminants to fish and wildlife contamination
occasional unpleasant odour	localized unpleasant odours from effluents and decomposing uprooted aquatic weeds	aesthetics	Domtar effluent; storms and ship traffic uproot aquatic weeds	

2.3 New Section 1.1, Addendum Summary

The following conclusions highlight conditions in the St. Lawrence Area of Concern that have changed since submission of the St. Lawrence RAP Stage 1 Report -- *i.e.*, increases or decreases of contaminant levels that have occurred since 1988. These conclusions are drawn from data presented on the following pages of this Addendum.

Ambient Conditions

PCB concentrations in spottail shiners increased between 1988 and 1991 in collections from MacDonnell and Pilon Islands. The cause of this increase is unknown. PCB residues exceeded the IJC Aquatic Life Guideline (100 ng/g) in ten of the eleven 1991 (91%) spottail shiner collections from the St. Lawrence River AOC.

PCB levels in walleye increased in 1990 and 1991 collections in comparison with 1987 collections. Mean PCB concentrations in walleye from Lake St. Francis increased from 0.163 mg/kg in 1987 to 0.295 mg/kg in 1990.

Dioxins and furans were detected in walleye collected from Lake St. Francis at the Raisin River in 1990. 2,3,7,8-TCDD was detected in three of five samples and ranged from 2.5 to 4.4 ng/kg. The same walleye collection also had high levels of zinc ranging from 2.4 to 6.2 mg/kg. HCB and OCS were detected in 85% of the fish tissue samples.

HCB levels in mallard breast muscle (fall collections) increased from 0.4 ng/g in 1988 to 1.3 ng/g in 1989. Levels of other organochlorine contaminants decreased over the same time period.

The 1991 zebra mussel monitoring program confirmed that zebra mussels occur in all sections of the St. Lawrence River throughout the AOC as compared to 1990 when they were documented only in the Cornwall, Massena and Prescott areas.

Sources

Domtar Inc.- Comparison of Contaminant Levels in Final Effluent Between 1987 (pre-MISA Monitoring Survey) and 1990 (MISA Monitoring Program)

Average concentrations of volatiles, in particular benzene, chloroform and toluene, increased by 2 to 5 times from 1987 to 1990.

Average concentrations of metals either decreased or remained constant over the same time period.

All PAH compounds, except for anthracene and naphthalene, increased in average concentrations. Benzo(a)pyrene was detected in 17% of effluent samples collected during the last six months of 1990 with an average concentration of 0.00012 mg/L.

BOD_5 average values increased from 132.8 in 1987 to 162.03 mg/L in 1990. Both values exceed the Ontario Industrial Effluent Objective of 15 mg/L.

TSS average values increased from 53.3 in 1987 to 75.69 mg/L in 1990. Both values exceed the Ontario Industrial Effluent Objective of 15 mg/L.

Cadmium concentrations decreased from 0.0011 in 1987 to 0.00067 mg/L in 1990. The 1990 value does not exceed the Ontario Industrial Effluent Objective of 0.001 mg/L.

AOX concentrations decreased by one-half from 1988 to 1990.

ICI Forest Products Contaminant Comparison

Mercury lost through air emissions steadily increased from 1984 through 1990 then abruptly decreased in 1991 from an annual total discharge of 99.9 kg in 1990 to 69.4 kg in 1991.

Mercury in final liquid effluent remained constant from 1982 through 1990. In 1991 the total amount discharged decreased by nearly half.

Final effluent loadings for all conventional parameters decreased between 1988 and 1990, but the Ontario Industrial Effluent Objectives were still exceeded for TSS.

Cornwall Chemicals - Comparison of Contaminant Levels in Final Effluent Between 1987 (pre-MISA Monitoring Survey) and 1990 (MISA Monitoring Program)

Concentrations of most contaminants in final effluent remained the same from 1987 through 1990.

Average concentration of chloroform decreased from 0.6175 mg/L in 1987 to 0.0894 mg/L in 1990.

Average concentration of tetrachloroethylene decreased from 0.02382 mg/L in 1987 to 0.0014 mg/L in 1990.

Average specific conductance decreased from 2400 μS/cm in 1987 to 1744 μS/cm in 1990.

Mercury concentration increased from an average of 0.0024 mg/L in 1987 to 0.00306 mg/L in 1990, continuing to exceed the Ontario Industrial Effluent Objective of 0.001 mg/L.

The 1990 MISA data indicated the presence of dioxins and furans in final effluent. TEQ was measured at 1.5 pg/L with an annual loading of 0.07 grams/year.

Stanchem Contaminant Comparison

Average concentration of total phosphorus increased from 0.468 mg/L in 1987 to 6.99 mg/L in 1990.

Average COD decreased from 121 mg/L in 1987 to 75 mg/L in 1990.

Average concentration of TSS decreased from 187.25 mg/L in 1987 to 66.89 mg/L in 1990. Values still exceed the Ontario Industrial Effluent Objective of 15 mg/L.

The average pH from all effluent streams decreased from 8.59 in 1987 to 7.16 in 1990.

Average mercury concentration decreased from 0.00315 mg/L in 1987 to 0.00269 mg/L in 1990. Values continued to exceed the Ontario Industrial Effluent Objective of 0.001 mg/L.

Courtaulds Fibres (closed 1992) - Comparison of Contaminant Levels in Final Effluent Between 1987 (pre-MISA Monitoring Survey) and 1990 (MISA Monitoring Program)

Average concentrations of mercury increased in the acid and alkaline sewers. Average concentrations in the acid sewer increased from 0.00238 mg/L in 1987 to 0.01026 mg/L in 1990. Alkaline sewer average concentrations increased from 0.0021 mg/L in 1987 to 0.00473 in 1990. Average mercury concentrations continued to exceed the Ontario Industrial Effluent Objective of 0.001 mg/L.

TSS concentrations increased in all sewers. Average concentrations in the alkaline sewer increased from 35.5 mg/L in 1987 to 111 mg/L in 1990. Average TSS concentrations in the acid sewer increased from 56.73 mg/L in 1987 to 91 mg/L in 1990. Average concentrations exceeded the Industrial Effluent Objective of 15 mg/L in both sewers. Although average concentrations more than doubled in all sewers but the storm sewer, they did not exceed the Objective.

Zinc concentrations increased in all sewers except the storm sewer. The highest average concentrations occurred in the acid sewer with values increasing from 48.1 mg/L in 1987 to 52.3849 mg/L in 1990. In 1990, average zinc concentrations exceeded the Ontario Industrial Effluent Objective of 1.0 mg/L in all sewers except the storm sewer, whereas in 1987 the Objective was exceeded only in the acid and storm sewers. Courtaulds Fibres was the greatest discharger of zinc, by an order of magnitude, in the entire Organic Chemical Manufacturing Sector in 1990 (Tuszynski 1992).

The 1990 MISA twelve month monitoring program reported mercury loadings of 0.074 kg/day from Courtaulds Fibres. This was the highest loading of any industry in the Organic Chemical Manufacturing Sector in 1990 (Tuszynski 1992).

Courtaulds Fibres closed its Cornwall operation on November 30, 1992.

Cornwall WPCP Contaminant Comparison

Annual average loading of BOD_5 decreased from 2,228.5 kg/day in 1988 to 958.4 kg/day in 1991.

Annual average loading of TSS decreased from 1024.41 kg/day in 1988 to 1004 kg/day in 1991.

Annual average loading of TP decreased from 43.70 kg/day in 1988 to 35.14 kg/day in 1991.

Waste Disposal Sites

PCB concentration in leachate from the City of Cornwall Sanitary Landfill may have changed between 1989 and 1991. PCB concentration was reported as <20 ng/L in 1989 and <3000 ng/L in 1991 (City of Cornwall 1991).

3.0 ADDENDUM TO CHAPTER 2: Socioeconomic Perspective

3.1 Errata

Page 2-1, fifth paragraph, first sentence: "Having a total land area of 3,367 hectares, the municipality has a population of about 46,800 (Statistics Canada 1986)."

4.0 ADDENDUM TO CHAPTER 3: The Mohawk Perspective

There are no changes to Chapter 3.

5.0 ADDENDUM TO CHAPTER 4: The Public Involvement Program

There are no changes to Chapter 4.

6.0 ADDENDUM TO CHAPTER 5: Environmental Database

6.1 Errata

Page 5-2, last paragraph, first sentence: "Cornwall, Ontario and Massena, New York (in the Grasse River watershed) are the major communities and industrial centres on the international section of the St. Lawrence River, with populations of 46,800 and 14,856 respectively (Kauss *et al.* 1988; Statistics Canada 1986)."

Page 5-9, last paragraph, last sentence: "... rehabilitation in the North American Waterfowl Management Plan, Eastern Habitat Joint Venture."

6.2 Update of Figure 5-2

Additional water intakes and outfalls have been added to Figure 5-2.

7.0 ADDENDUM TO CHAPTER 6: Description of Environmental Conditions and Concerns

7.1 Errata

Page 6-46, third paragraph, third sentence: "Class 1, 2 and 3 wetlands are designated as provincially significant wetlands."

Page 6-51, third paragraph, first sentence: "All data are assessed using Health and Welfare Canada's guideline levels of 0.5 mg total mercury/kg and 2.0 mg total PCB/kg in the edible portion of fish"

Page 6-57, second paragraph, second sentence: "....only 0.2 ppm below the Health and Welfare guideline of 2.0 ppm for the edible portion of fish."

Page 6-57, sixth paragraph, last sentence: "Present mirex levels in walleye are mostly below the Health and Welfare guideline level of 0.1 ppm in fish, with mirex non-detectable in walleye sampled in 1985, 1987, 1989 and 1991. Walleye collected in 1990 had a mean mirex concentration of 0.114 ppm."

Page 6-58, second paragraph, fifth sentence: "Although the concentration was high, it was below the Health and Welfare maximum residue limit for DDT and related metabolites of 5.0 ppm in fish."

Page 6-60, first paragraph, first sentence: "...of little concern with the exception of elevated concentrations of total chlordanes, PCBs and lead."

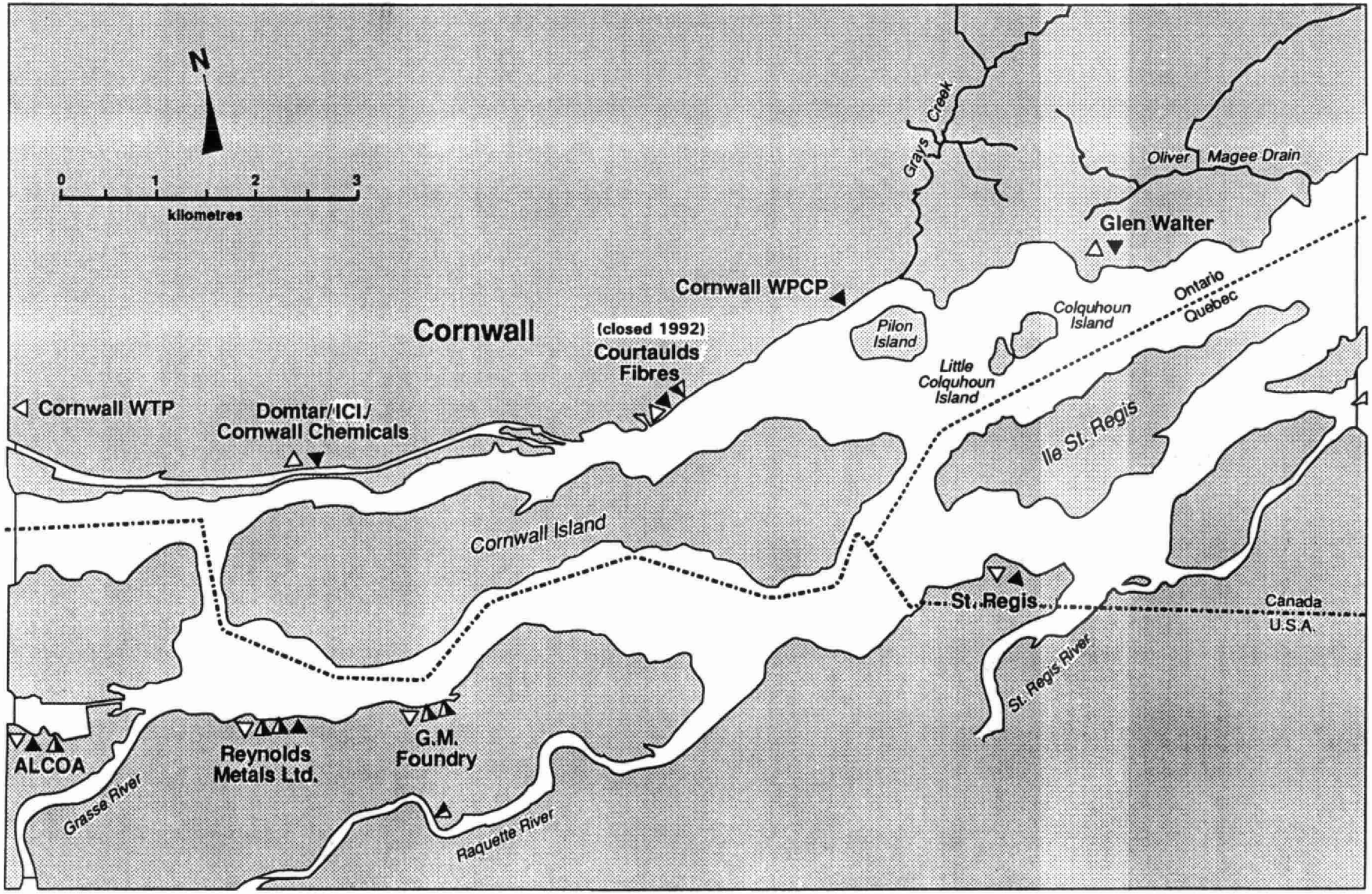
Page 6-60, second paragraph, first sentence: " ...showed elevated levels of lead in breast muscle which exceed the maximum tolerance for lead (0.5 ppm) in fish protein, as defined in the Canadian Food and Drug Regulations."

figure 5-2

St. Lawrence Remedial Action Plan - Cornwall / Lake St. Francis area

Location of major industries, intakes and outfalls

(Anderson 1990)



△ Intake

▲ Outfall (in pipe)

◮ Outfall (in river at shore)

7.2 Addendum to Section 6.1.2, Nutrients

Elevated nutrient concentrations occur in waters of the United States at the mouths of the Grasse, Raquette and St. Regis Rivers. Although phosphorus loadings from these tributaries are low compared with those from Lake Ontario, they still represent a substantial source of phosphorus to the St. Lawrence River AOC, ranging from 76.7 to 252.1 kg/day total phosphorus (Table 1).

Table 1. Estimated total phosphorus loadings to the St. Lawrence River and Massena AOC sub-basins (NYSDEC 1990).

Source	Flow (m^3/sec)	Average Total Phosphorus Concentration (mg/L)	Phosphorus Loading (tonnes/year)	Phosphorus Loading (kg/day)
Lake Ontario (Wolfe Island)*	8039	0.011	2789	7641.1
Oswegatchie River	81	0.036	92	252.1
Raquette River	60	0.022	42	115.1
Grasse River	32	0.048	48	131.5
St. Regis River	25	0.035**	28	76.7

* these NYSDEC Lake Ontario (Wolfe Island) values are similar to data obtained at Environment Canada's Wolfe Island monitoring station (H. Biberhofer, pers. comm.), for which 1989-90 total phosphorus values were:

average total P concentration - 0.016 mg/L
estimated total P loading - 9699 kg/day

** Estimated value

In the United States, the New York State Department of Environmental Conservation (NYSDEC) has not imposed a requirement for phosphorus removal on any of its sewage treatment plants located downstream of Lake Ontario. Annex 3 of the Great Lakes Water Quality Agreement (GLWQA) has been interpreted as applying to Lake Ontario but not the St. Lawrence River. Phosphorus levels are therefore not monitored at New York State sewage treatment plants discharging directly to the St. Lawrence River or its tributaries.

Table 2A lists US sewage treatment plants draining to the St. Lawrence River in the stretch from Lake Ontario downstream into the Massena RAP Area of Concern. Hydraulic capacities are shown and were used to estimate total phosphorus loading (kg/day), based on an assumed average total phosphorus concentration of 3.0 mg/L.

Table 2B lists Ontario sewage treatment facilities along the St. Lawrence River in the stretch from Lake Ontario into the Cornwall RAP Area of Concern. Hydraulic capacities and average phosphorus loadings (kg/day) (from monthly measurements) are shown.

Table 2A. New York State municipal wastewater discharges, number of combined sewer overflows (CSOs) and estimated total phosphorus loadings (kg/day) (NYSDEC 1990).

Facility (New York State)	Basin/Sub-Basin	Design Flow (m^3/day)	Number of CSOs	Estimated* Total Phosphorus Loading (kg/day)
Canton (V)	Grasse River	7,570	-	22.71
Madrid (T)		454	-	1.36
Massena (V)		10,220	6	30.66
Colton (T)	Raquette River	265	-	0.79
Morfolk (T)		606	-	1.82
Norwood V)		1,628	-	4.88
Potsdam (T)		151	-	0.45
Potsdam (V)		12,491	-	37.47
Tupper Lake (V)		4,164	-	12.49
Brasher Falls (T)	St. Regis River	454	-	1.36
DeKalb Junction (T)	Oswegatchie River	114	-	0.34
Edwards (V)		303	-	0.91
Gouverneur (V)		13,248	1	39.74
Hammond (V)		151	-	0.45
Heuvelton (V)		1,703	-	5.11
Wanakena		58	-	0.17
Cape Vincent (V)	St. Lawrence River	530	3	1.59
Clayton (V)		1,173	2	3.52
Alexandria Bay (V)		2,839	2	8.52
Ogdensburg (C)		24,603	18	73.81
Waddinton (V)		606	-	1.82
Malone (V)	Salmon River	14,005	-	42.01

* Calculated using an assumed average total phosphorus concentration of 3.0 mg/L.

(V) Village
(T) Town
(C) City

Table 2B. Ontario municipal wastewater discharges and estimated total phosphorus loadings (kg/day) in 1990 (Environment Ontario data files).

Facility (Ontario)	Basin/Sub-Basin	Design Flow (m^3/day)	Total Phosphorus Loading (kg/day)
Brockville (C)	St. Lawrence River	21,820	23.60
Charlottenburgh Lagoon (V)	St. Lawrence River	525	0.3
Cornwall (C)	St. Lawrence River	54,552	42.1
Gananoque (T)	Stocking Creek Gananoque River	3,273	14.89
Ingleside (V)	St. Lawrence River	1,573	3.92
Iroquois (V)	St. Lawrence River	5,001	1.42
Kingston (C)	St. Lawrence River	61,371	34.11
Lancaster Lagoon (V)	Finney Creek	590	5.55
Long Sault (V)	St. Lawrence River	1,364	3.71
Morrisburg (V)	St. Lawrence River	2,273	5.59
Prescott (T)	St. Lawrence River	5,683	2.49

(V) Village
(T) Town
(C) City

7.3 Addendum to Section 6.2.1, Suspended Sediment

Organic Contaminants

The main sources of PCBs to the St. Lawrence AOC are three industrial discharges in the area of Massena, New York: ALCOA, General Motors and Reynolds Metals. They discharge waste water directly to the St. Lawrence River or its tributaries. In addition, PCBs are suspected to be leaching from hazardous waste and landfill sites located on these industrial properties (St. Lawrence RAP Team 1992).

Total annual discharges of PCBs by these three industries in 1989 were estimated as: 12.45 kg/year (ALCOA), 1.16 kg/year (Reynolds Metals) and 0.02 kg/year (General Motors) (NYSDEC 1990). These estimates include permitted discharges only. They do not include surface runoff from the industrial sites and contaminated groundwater draining into the St. Lawrence River, although these non-point sources cannot be ignored. The annual loading of PCBs in industrial surface runoff was estimated as 14 kg/year in 1989 (NYSDEC 1990). Bottom sediment heavily contaminated with PCBs downstream of these sources also contributes PCBs to the water column.

Additional data are required to better assess water quality with respect to chlorinated benzenes and chlorinated phenols. Future studies should address these data gaps in the St. Lawrence (Cornwall) RAP Stage 1 Report. The MISA monitoring program has helped to provide additional data on effluent contaminant concentrations since 1988 (see Section 8 of this Addendum).

7.4 Addendum to Section 6.2.2.2, Chemical (Bottom Sediment)

Results from a 1991 Environment Ontario bottom sediment survey confirm results of previous surveys done in the AOC (Richman, 1991). The Provincial Sediment Quality Guidelines "lowest effect level" was exceeded at all sites (including upstream control sites) for phosphorus and total Kjeldahl nitrogen (TKN) and at all but one site for total organic carbon. Twenty seven percent of the samples exceeded the "severe effect level" for TKN. Nutrient concentrations were not correlated with particle size, which indicates a significant contribution of nutrients from Lake Ontario in addition to local municipal point sources and non-point sources (*i.e.*, agricultural runoff). Nutrient concentrations in the sediment may contribute to high nutrient concentrations in the water column, but this has not been investigated.

7.5 Addendum to Section 6.2.2.3, PCBs and Other Contaminants (Sediment)

PCBs

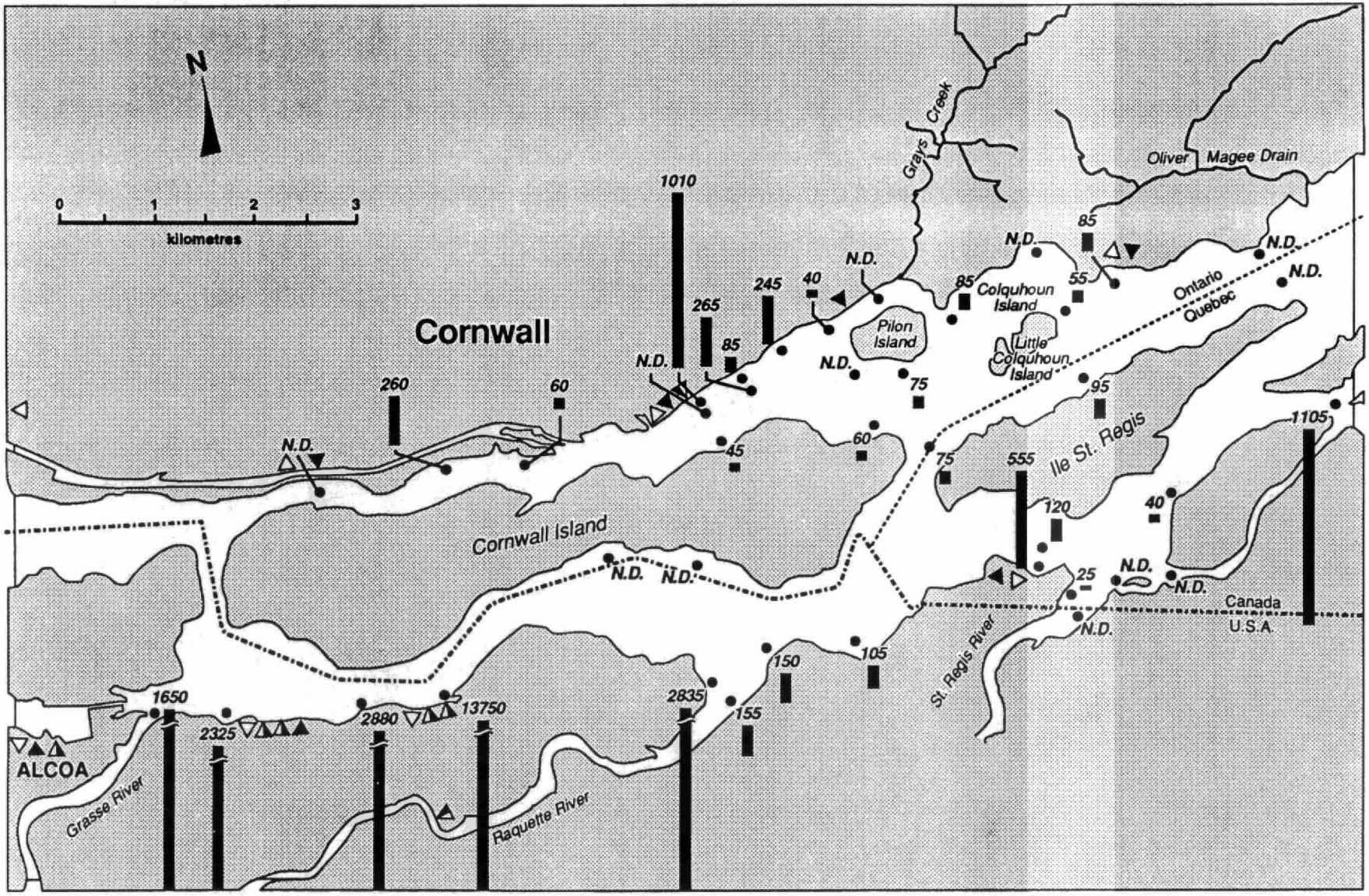
Trace elements and organic contaminants tend to accumulate and bind to the clay/silt sediment fraction, which consists of particle sizes less than 62 μm (Forstner and Wittmann 1979; Krumgalz *et al.* 1992). This is due to the large surface area of this fraction and to the strong adsorptive properties of clay minerals (Forstner and Wittmann 1979). Consideration of the possible partitioning of compounds into various sediment fractions and (particle sizes) assists in identifying contaminant sources.

Although not all of the 1985 data presented in the Stage 1 Report were corrected for particle size, a cursory examination of PCB concentrations at sampling sites (Figure 6-14) shows particularly high values in the vicinity of known PCB sources on the US side of the river. Figure 1 shows the same sampling stations as Figure 6-14 with corresponding particle size distributions. Contaminant concentrations tend to be higher at stations with a higher percentage of fine particles, but the highest values were still at sites close to contaminant sources. In particular, station 393 (Figure 1) had a low percentage of fine particles but high concentrations of PCBs. This site is affected by effluent and runoff from ALCOA. Station 368 (Figure 1), on the Canadian side of the river, also had elevated PCB concentrations. This site is a known deposition zone and tends to accumulate high levels of most metals as well as PCBs. Although some of the contaminants associated with this site come from local sources, the presence of PCBs requires further investigation.

St. Lawrence Remedial Action Plan - Cornwall / Lake St. Francis area

PCB levels (ng/g) in sediment from the Cornwall-Massena reach of the St. Lawrence River, 1985

(Anderson, 1990)



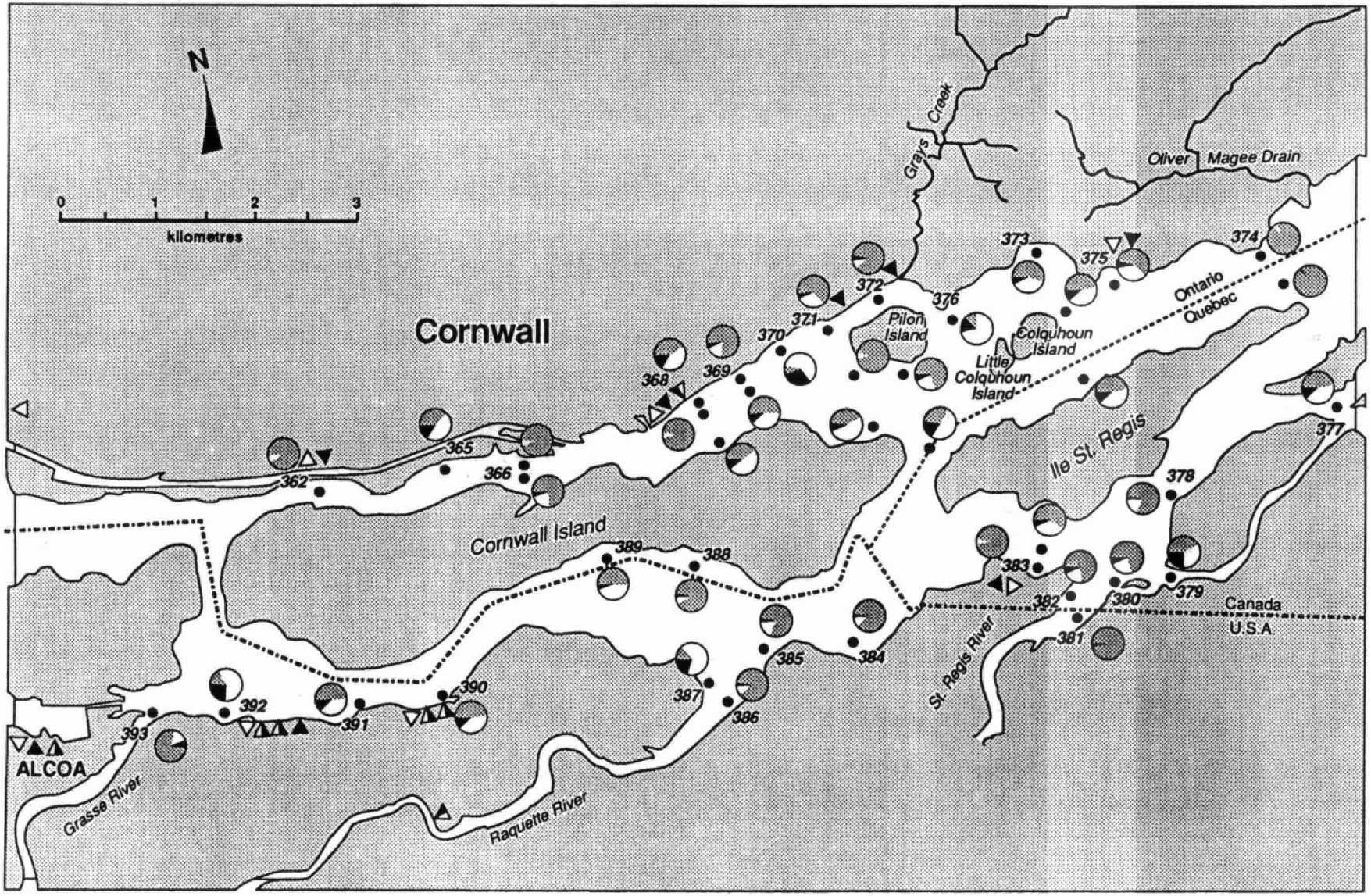
△ Intake
▲ Outfall (in pipe)
◮ Outfall (in river at shore)

260 PCB levels in ng/g

St. Lawrence Remedial Action Plan - Cornwall / Lake St. Francis area

Bottom sediment particle-size distribution in the St. Lawrence River, 1985

(Anderson, 1990)



△ Intake
▲ Outfall (in pipe)
◮ Outfall (in river at shore)

% sand
% clay
% silt

Dioxins and Furans

In 1985, Environment Canada conducted a survey of dioxins and furans in bottom sediment in receiving waters adjacent to Canadian pulp and paper mills. Three sediment reaches were sampled at the Domtar mill in Cornwall, Ontario (Trudel 1991). Each reach was sampled at three sites (Figure 2). The reach upstream of the Domtar diffuser was termed 25a; reach 25b was located immediately downstream of the diffuser; and reach 25c was just upstream of where the Cornwall Canal discharges into the St. Lawrence River. Bottom sediments, collected from each reach, were composited into a single sample per reach. Aliquots were taken for the respective analyses.

Dioxin and furan data were reported in two formats: as measured concentration from the laboratory analysis and as calculated Toxic Equivalent (TEQ). The different toxicities of the various types of dioxins and furans makes direct comparison of measured concentrations difficult to interpret. The measured concentration of each dioxin or furan is therefore multiplied by a Toxic Equivalency Factor (TEF). This converts concentration to Toxic Equivalent (TEQ), which represents the compound's overall toxicity relative to the most toxic form of dioxin (2,3,7,8-TCDD).

Results from the 1985 survey (Trudel 1991) are shown in Table 3. To facilitate the task of describing all the mills in Canada, a toxicity class structure was used for the homologue groups. On the premise that a non-detect does not confirm the absence of a compound, TEQs for non-detects were derived from arbitrary values that were a function of the analytical detection limit. Table 3 also includes, for comparison, TEQs calculated using only detected compounds.

Six of the twelve groups of dioxins and furans were measured at the sites downstream of Domtar, whereas only octochlorodibenzo-p-dioxin (O8CDD) was measured at the upstream site. The differences in TEQs were more pronounced when only detected values were used. Hexachlorodibenzofuran (H6CDF) contributed the largest proportion to the calculated TEQ for both downstream samples.

7.6 New Section 6.2.2.5, Environment Canada 1991 Sediment Quality Survey

A survey of bottom sediment quality was conducted by Environment Canada in 1991, between May and October (Mudroch, unpublished data). The study was designed to define the physical character of bottom sediments in order to locate areas of fine-grained sediment accumulation, and to determine the physico-chemical properties of the sediment, particularly particle size distribution and concentrations of major and trace elements, nutrients, PCBs, PAHs, dioxins and furans. Information from the survey is relevant to the planning of any sediment remedial action in the St. Lawrence River AOC.

The distribution of fine-grained sediment was determined using a side scan sonar/sub-bottom profiler system. Areas of fine-grained sediment are depositional areas in which contaminants are most likely to accumulate. Bottom sediment types included till, gravel, boulders, sand, shells and fine-grained sediment. Two areas of fine-grained sediment accumulation were identified: the largest was along the Cornwall waterfront, from the Courtaulds outfall downstream almost to Pilon Island (Figure 3); the other area was in an embayment immediately downstream from the mouth of the Cornwall Canal.

Surface sediment was collected at eight stations (numbered 3 through 10) in the areas indicated by the side-scan sonar results as depositional areas of fine-grained sediment (Figure 3). Samples were collected on October 22, 1991. At stations 3 and 10, each of three grab samples were sub-sampled in order to estimate variability in concentrations of major and trace elements, PCBs and PAHs. A summary of the results is provided in Table 4.

As shown in Table 4, concentrations of mercury, lead, zinc, copper, chromium, nickel, cadmium, total nitrogen, TOC, total PCBs and total PAHs exceeded the Provincial Sediment Quality Guidelines lowest effect level in some cases. The severe effect level was exceeded only by mercury, and only at station 3 (in 4 of 10 samples from station 3). The lowest effect level for total PCB (0.07 mg/kg) was exceeded in 23 of the 26

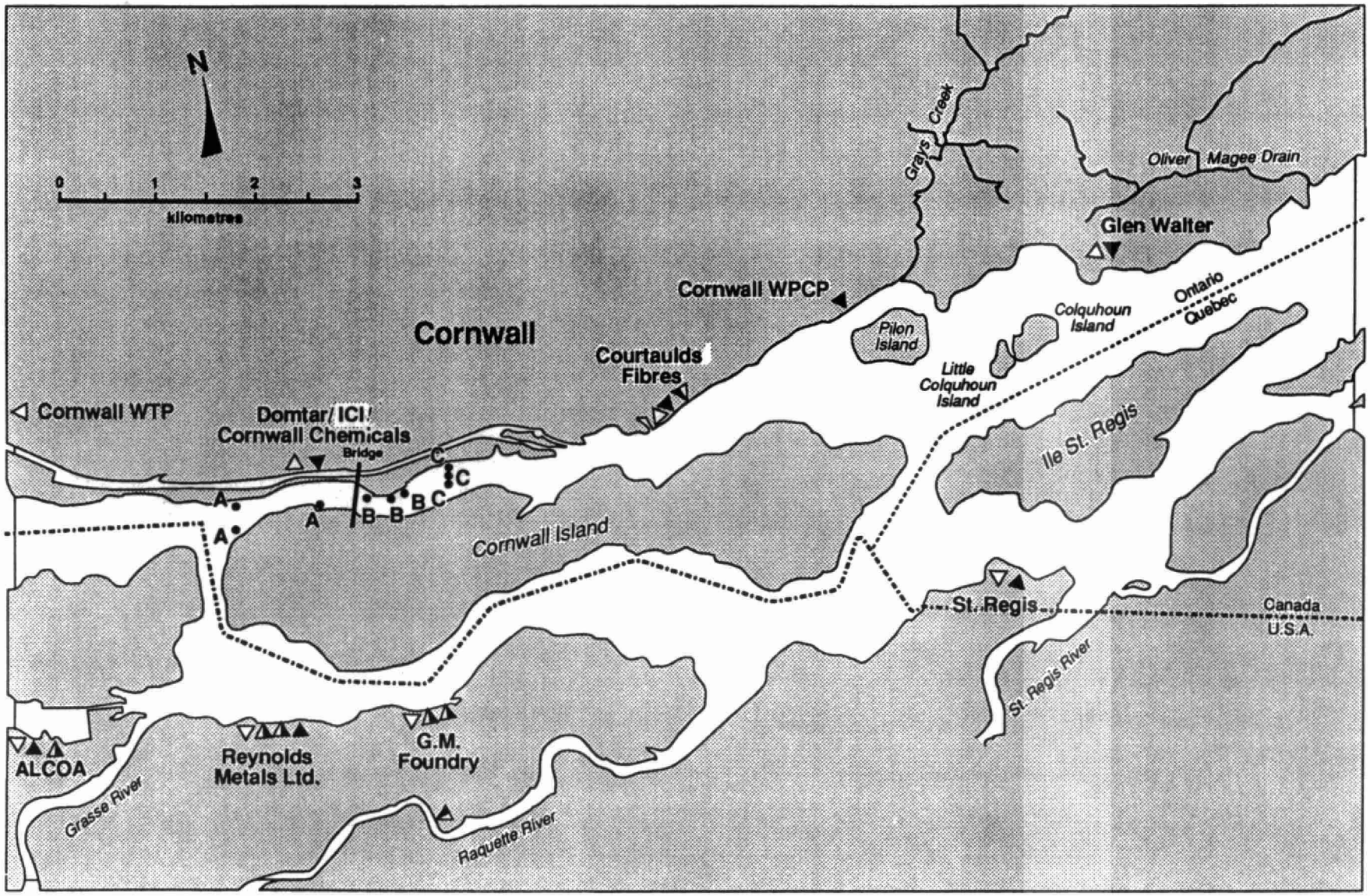
samples, and the lowest effect level for total PAH (4 mg/kg) was exceeded in 20 of the 26 samples. Concentration of total PAH was an order of magnitude higher in some station 3 samples (4 of 10 samples) than in samples from the other stations. Sediment quality guidelines have not been developed for dioxins and furans. Concentrations of scandium, arsenic, tin, antimony, tellurium, tungsten and bismuth were all below their respective detection limits.

figure 2

St. Lawrence Remedial Action Plan - Cornwall / Lake St. Francis area

Estimated sediment sampling locations

(from Trudel 1991)



△ Intake

▲ Outfall (in pipe)

◮ Outfall (in river at shore)

A - C • Sediment Sampling Location

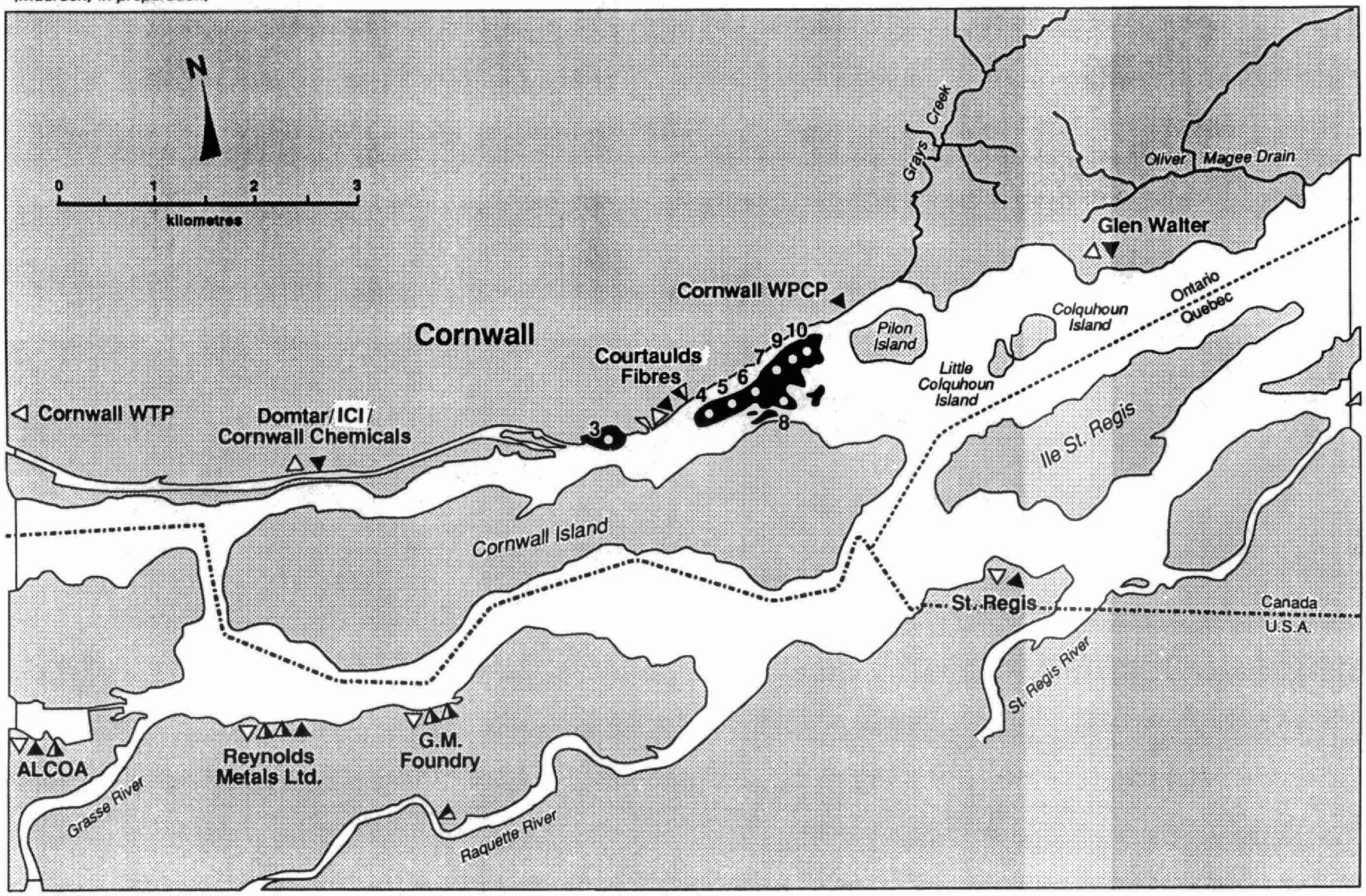
Table 3. Concentrations and estimated Toxic Equivalents (TEQs) of dioxins and furans in bottom sediment in the vicinity of the Domtar diffuser, Cornwall, Ontario. Samples were taken in 1985 by Environment Canada (Trudel 1991).

Sample No.	Compound												
	2378 TCDD	T4CDD	P5CDD	H6CDD	H7CDD	O8CDD	2378 TCDF	T4CDF	P5CDF	H6CDF	H7CDF	O8CDF	TOTAL
Measured Concentration (pg/g dry weight)													
25a	<20	<20	<61	<62	<140	168	<20	<20	<61	<62	<140	<101	
25b	<13	<13	<5	<52	120	827	<13	<13	120	800	401	920	
25c	<12	<12	<120	<97	813	3468	<12	<12	114	276	584	621	
Estimated TEQ (includes non-detected compounds)													
25a	10	-	15.3	3.1	0.7	0.17	1	-	1.5	3.1	0.7	0.05	35.6
25b	7.5	-	4.8	2.6	1.2	0.83	0.7	-	6	80	4	0.92	108.5
25c	7.5	-	30	4.9	8.1	3.47	0.6	-	5.7	27.6	5.8	0.62	94.3
Estimated TEQ Based On Detected Compounds													
25a	-	-	-	-	-	0.17	-	-	-	-	-	-	0.17
25b	-	-	-	-	1.2	0.83	-	-	6	80	4	0.92	92.95
25c	-	-	-	-	8.1	3.47	-	-	5.7	27.6	5.8	0.62	51.29

St. Lawrence Remedial Action Plan - Cornwall / Lake St. Francis area

Location of areas of fine-grained sediment and sample locations, 1991 Environment Canada survey

(Mudroch, in preparation)



△ Intake
▲ Outfall (in pipe)
◮ Outfall (in river at shore)

4 Area of fine-grained sediment with sample location (1-10)

Table 4. Summary of parameters measured in fine-grained bottom sediment from depositional areas in the St. Lawrence River AOC. Samples were collected by Environment Canada on October 22, 1991 (Mudroch, unpublished data).

Parameter	Concentration Range (mg/kg)	Provincial Sediment Quality Guidelines*	
		Lowest Effect Level (mg/kg)	Severe Effect Level (mg/kg)
Mercury	0.667 - 6.032	0.2	2.0
Lead	<2 - 35	31	250
Zinc	49 - 346	120	820
Copper	9 - 62	16	110
Vanadium	16 - 28	-	-
Chromium	9 - 33	26	110
Cobalt	<1 - 6	-	-
Nickel	8 - 27	16	75
Strontium	40 - 80	-	-
Yttrium	7 - 13	-	-
Molybdenum	2 - 5	-	-
Silver	<0.2 - 1	-	-
Cadmium	<0.2 - 1.2	0.6	10
Barium	35 - 95	-	-
Lanthanum	9 - 18	-	-
Total Nitrogen	419 - 3,423	550	4,800
TOC	0.55 - 4.66	1	10
Total PCBs	0.04 - 0.33	0.07	530
Total PAHs	2.895 - 20.944	4	10,000
Total Dioxins	763 - 1938 pg/g	-	-
Total Furans	40 - 898.3 pg/g	-	-

* Provincial Sediment Quality Guidelines for the protection of aquatic life

7.7 Addendum to Section 6.3.4.1, Young Fish

In surveys of young-of-the-year spottail shiners carried out by the Ontario Ministry of the Environment between 1979 and 1991, total PCB residues in fish from New York waters continued to be higher than in those from Ontario waters. PCB concentrations in the Grasse River, Reynolds Aluminum and General Motors collections are significantly higher (ANOVA $p<0.05$) than PCB levels in other shiner collections from the St. Lawrence River (Table 6-11) (Suns *et al.* 1991). However, significant ($p<0.05$) reductions in PCB residues were observed in the Grasse River samples over the period 1979-1991. Clean-up activities aimed at reducing PCB discharges were implemented at ALCOA during 1991 (L. Skinner pers. comm. to K. Suns) and this may have influenced PCB availability in the Grasse River, resulting in reductions in fish residues.

In 1991 spottail collections from MacDonnell Island and Pilon Island, PCB concentrations were greater than those of previous years. The cause of the PCB increase in fish collections from Ontario waters is unknown. Of particular interest is the increase at MacDonnell Island, located above the Cornwall Hydro dam and well removed from direct industrial inputs. It would be convenient to link PCB residue increases in the MacDonnell and Pilon Island samples to increased lipid levels in the 1991 collections, but because mercury residues increased concurrently with PCBs in both collections, it is doubtful whether increased lipid content can be identified as the principal cause for PCB residue increases in fish (Suns pers. comm. to J. Anderson).

In the 1990 and 1991 surveys, PCB concentrations exceeded the IJC Aquatic Life Guideline (100 ng/g) in ten of the eleven 1991 (91%) St. Lawrence spottail shiner collections.

Mercury concentrations in shiners were similar for fish collected from both shorelines of the St. Lawrence and were well below 500 ng/g, the Great Lakes Water Quality Agreement Specific Objective for the protection of fish-eating birds and wildlife (Table 6-11).

Table 6-11. Mean organochlorine and mercury concentrations (ng/g wet weight) in young-of-the-year spottail shiners from the St. Lawrence River AOC (1979-1991, Ontario Ministry of the Environment) (Suns *et al.* 1991 and Suns pers. comm. to J. Anderson 1992). In-river samples were collected approximately 1 km upstream of river mouth. Standard deviation in parentheses. ND = not detected; TR = trace; NA = not available.

Sample Location	Sample Year	No. of Samples	Fish Length (mm)	% Fat	Hg	Total PCBs	Total DDT	OCS	Mirex	HCB	Chlordane Total
Bluechurch Bay (Maitland)	1983	5	56 (4)	2.0 (0.5)		148 (73)	22 (6)	1 (0)	ND	2 (1)	
	1985	5	56 (3)	2.3 (0.3)		72 (27)	10 (3)	ND	ND	5 (3)	
	1988	7	39 (3)	2.7 (0.9)		ND	6 (4)	ND	ND	2 (1)	
	1989	7	53 (3)	7.4 (0.8)		ND	8 (4)	ND	ND	2 (1)	
Morrisburg	1988	6	55 (2)	1.5 (0.2)	19 (8)	ND	6 (3)		ND	ND	
	1989	7	41 (5)	4.8 (0.3)		ND	6 (2)		ND	ND	
MacDonnell Island	1979	8	49 (5)	1.5 (0.6)	56 (5)	ND	79 (20)		ND	ND	9 (2)
	1987	7	57 (5)	2.1 (0.3)	38 (4)	36 (19)	8 (2)	ND	ND	ND	
	1988	7	50 (2)	1.3 (0.2)	20 (13)	ND	2 (2)	ND	ND	TR	
	1989	5	46 (3)	2.6 (0.2)	11 (8)	ND	11 (2)	ND	ND	ND	
	1990	6	49 (5)	1.6 (0.2)	NA	ND	6 (1)		ND	ND	
	1991	7	59 (1)	4.4 (0.6)	63 (8)	97 (14)	11 (2)		ND	ND	
Below Hydro Dam	1990	6	43 (4)	2.1 (0.2)	NA	26 (17)	5 (3)		ND	ND	
Cornwall Island - North	1987	7	52 (1)	1.9 (0.2)	40 (0)	58 (44)	8 (8)	ND	ND	ND	
	1988	7	50 (1)	2.4 (0.4)		261 (65)	46 (17)	ND	ND	ND	
	1989	7	39 (3)	2.8 (0.5)		47 (72)	23 (13)	ND		ND	
Cornwall - Upstream of marina	1979	3	50 (3)	3.6 (1.2)	70 (10)	243 (31)	62 (14)		7 (1)	3 (1)	
	1980	4	55 (3)	4.1 (0.8)	68 (10)	367 (100)	50 (10)		12 (2)	2 (1)	
	1981	4	52 (3)	2.0 (0.0)		234 (34)	22 (8)		8 (2)	ND	
	1983	5	51 (4)	2.8 (0.3)		199 (71)	25 (12)	2 (1)	8 (5)	2 (1)	
	1987	7	56 (4)	1.9 (0.3)	46 (5)	37 (20)	5 (3)	ND	ND	ND	
	1988	7	53 (1)	2.5 (0.5)	102 (29)	161 (43)	19 (9)	ND	ND	ND	
	1989	6	51 (8)	4.5 (0.8)	85 (10)	78 (63)	14 (6)	ND	ND	1 (2)	
	1990	5	47 (4)	2.7 (0.2)	64 (9)	165 (67)	27 (12)		11 (6)	TR	
	1991	7	57 (2)	4.6 (0.7)	77 (10)	251 (143)	33 (23)		ND	ND	
Transport Cda Training Instit.	1987	7	52 (1)	2.1 (0.2)	40 (0)	38 (19)	7 (1)	ND	ND	ND	
	1989	7	45 (5)	4.4 (0.6)		76 (67)	18 (6)	ND	ND	ND	
Pilon Island	1987	5	53 (1)	2.4 (0.2)	40 (0)	92 (4)	8 (5	ND	ND	ND	
	1988	7	48 (2)	2.5 (0.4)	48 (18)	74 (48)	9 (8)	ND	ND	ND	
	1989	7	53 (5)	4.6 (0.8)	25 (11)	54 (62)	14 (6)	ND	ND	ND	
	1990	7	44 (3)	1.9 (0.4)	29 (7)	62 (21)	9 (2)		ND	ND	
	1991	7	52 (3)	3.7 (0.8)	60 (6)	189 (28)	23 (6)		ND	ND	
Grasse River, NY (in river)	1979	7	51 (2)	1.9 (0.4)	43 (12)	2072 (187)	95 (14)		ND	ND	
	1981	7	53 (2)	1.7 (0.3)	NA	1117 (235)	39 (13)		ND	ND	
	1983	6	52 (4)	1.6 (0.2)	NA	954 (343)	5 (4)	2 (2)	ND	ND	
	1987	7	53 (3)	1.7 (0.2)	40 (0)	953 (197)	15 (2)	ND	ND	ND	
	1988	7	50 (3)	3.1 (0.2)	38 (10)	7729 (2027)	ND	ND	ND	ND	
	1989	7	50 (7)	6.1 (1.1)	NA	9071 (2004)	2 (2)	ND	ND	ND	
	1991	7	48 (5)	3.4 (1.2)	NA	3420 (1257)	4 (4)		ND	ND	
Cornwall Island - South	1987	7	48 (1)	2.1 (0.4)	47 (6)	252 (83)	24 (8)	1 (1)	ND	ND	
	1988	7	50 (1)	2.1 (0.3)		164 (38)	7 (6)	ND	ND	1 (1)	
	1989	5	46 (7)	3.9 (0.6)		392 (147)	5 (3)	8 (4)	ND	1 (1)	
GM Plant at Bridge, NY	1987	7	50 (1)	1.4 (0.2)	NA	1262 (324)	30 (10)	ND	ND	ND	
	1988	7	45 (1)	2.0 (0.6)	NA	21529 (4299)	ND	ND	ND	3 (3)	
	1989	5	50 (12)	4.6 (0.7)	NA	22640 (1402)	ND	ND	ND	ND	
	1990	7	45 (4)	1.4 (0.3)	NA	1544 (1093)	17 (10)		ND	ND	
	1991	7	56 (7)	4.3 (1.4)	59 (14)	3060 (2997)	32 (10)		ND	ND	

Table 6-11 (Cont'd)

Sample Location	Sample Year	No. of Samples	Fish Length (mm)	% Fat	Hg	Total PCBs	Total DDT	OCS	Mirex	HCB	Chlor-dane Total
Raquette River, NY (in river)	1979 1987 1988 1989 1991	7 5 7 7 7	50 (2) 53 (4) 50 (1) 36 (5) 59 (2)	2.1 (0.5) 1.5 (0.2) 3.0 (0.4) 4.4 (0.9) 5.4 (0.5)	39 (7) 38 (5) NA NA 46 (14)	377 (81) 84 (17) 1837 (455) 1203 (402) 261 (31)	92 (25) 5 (3) 22 (8) 9 (8) 6 (1)	 2 (1) ND ND	ND ND ND ND ND	ND ND ND ND ND	
Reynolds Aluminum, NY	1989 1990 1991	5 7 7	53 (13) 50 (4) 58 (2)	6.7 (0.7) 2.4 (0.4) 6.5 (0.8)	NA 34 (8) NA	16600 (894) 2220 (2086) 4426 (1597)	20 (8) 30 (29) 9 (8)	ND	ND ND ND	ND ND ND	
Regis River, NY (in river)	1987 1989	7 7	52 (1) 57 (6)	2.1 (0.2) 2.0 (0.5)	27 (8) NA	126 (30) 36 (26)	7 (2) 5 (2)	TR ND	ND ND	ND ND	
Regis River, NY (from St. Lawrence)	1991	7	60 (1)	7.0 (0.8)	NA	197 (47)	7 (1)		ND	ND	
Salmon River, Que (in river)	1987 1989	7 7	53 (2) 41 (40	2.3 (0.2) 2.3 (0.4)	19 (7) NA	59 (12) ND	27 (26) 32 (10)	ND ND	ND ND	ND ND	
Salmon River, Que (from St. Lawrence)	1991	7	60 (4)	3.3 (0.5)	44 (8)	229 (55)	11 (4)		ND	ND	
Thompson Island (Lake St. Francis)	1987 1988 1989 1990	7 7 7 6	49 (1) 43 (1) 49 (3) 45 (4)	21. (0.3) 1.9 (0.1) 2.1 (0.1) 2.6 (0.4)	40 (0) NA NA 40 (0)	46 (24) 23 (22) ND 38 (22)	7 (3) 3 (3) 2 (2) 7 (2)	ND ND ND	ND ND ND ND	ND ND ND ND	
Raisin River (in river)	1987	7	56 (1)	3.3 (0.4)	50 (10)	36 (10)	6 (2)		ND	ND	
Raisin River (from St. Lawrence)	1991	4	51 (7)	4.0 (0.6)	NA	143 (40)	4 (1)		ND	ND	
Buchanan Island	1991	4	60 (3)	4.8 (0.5)	43 (5)	165 (30)	7 (2)		ND	ND	

7.8 Addendum to 6.3.4.2, Sportfish

In sportfish surveys conducted by MOE and MNR in 1990, 1991 and 1992, the species most commonly analyzed was walleye; carp, yellow perch, pike, smallmouth bass, white sucker and brown bullhead were also tested. All fish were analyzed for mercury, PCBs and mirex, and analyses for a variety of pesticides, PAHs, organochlorine compounds, metals and dioxins and furans were carried out on fish from some, but not all, sampling locations. For example, dioxins and furans were tested only in fish collected from Lake St. Francis at the Raisin River during 1990.

Table 5 compares mercury, PCB and mirex concentrations in 1990 and 1991 walleye collections from a variety of locations upstream of and within the AOC. When these values are compared to 1987 values (Table 6-15 of the Stage 1 Report), it is evident that mercury concentrations in walleye have remained constant, while PCB concentrations have increased. Mean PCB concentration in walleye from Lake St. Francis increased from 0.163 mg/kg in 1987 to 0.295 mg/kg in 1990.

Table 5. Mean mercury, PCB and mirex concentrations (mg/kg) in walleye collected in 1990 and 1991 from the St. Lawrence River Area of Concern (Environment Ontario & OMNR Data Files). Range shown in parentheses. N=Number of fish sampled.

Location	Year	N	Length (cm)	Weight (g)	Hg (mg/kg)	PCB (mg/kg)	Mirex (mg/kg)
St. Lawrence River, Johnston to Iroquois (upstream of Cornwall)	1990	1	50.2 (-)	1500 (-)	0.32	0.036 (-)	ND
Lake St. Francis, East of Hamilton Island	1991	20	59.3 (48.0-74.5)	2072 (911-3742)	1.03 (0.33-1.90)	NA	NA
Lake St. Francis, West of Hamilton Island	1991	19	47.8 (33.5-68.4)	1200 (371-2633)	0.48 (0.06-1.10)	0.109 (0.028-0.537)	ND
Lake St. Francis	1990	8	53.0 (48.1-61.4)	1360 (1030-2075)	0.66 (0.34-1.20)	0.295 (0.028-1.66)	0.011 (ND-0.075)
Lake St. Francis, at Raisin River	1990	20	60.8 (42.8-69.9)	NA	0.92 (0.33-1.50)	1.940 (0.168-4.290)	0.114 (ND-0.381)
	1991	16	55.8 (40.0-75.2)	1828 (600-4000)	0.79 (0.33-1.60)	0.116 (ND-0.486)	ND (ND-0.020)

Health & Welfare Canada guidelines for the consumption of sportfish (mg/kg muscle tissue (wet weight):
Total PCB 0.2 mg/kg; Mirex 0.1 mg/kg; Total mercury 0.5 mg/kg

The 1990 walleye collections from Lake St. Francis at the Raisin River were also analyzed for dioxins and furans. Dioxins and furans are a family of compounds consisting of polychlorinated dioxins and 135 isomers of polychlorinated furans. The most toxic forms are those substituted at the 2,3,7,8 positions, in particular 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (Smith, Environment Ontario unpublished data).

Table 6 lists concentrations of dioxins and furans in walleye collected in April 1990 from Lake St. Francis at the Raisin River. 2,3,7,8-TCDD was detected in three out of five samples. Values ranged from 2.5 to 4.4 ng/kg for the three samples. The toxicity of the various dioxin and furan isomers can be expressed relative to 2,3,7,8-TCDD using Toxic Equivalent (TEQ) units (Safe 1990; Environment Ontario 1985). TEQ values in walleye ranged from ND to 6.30 ng/kg (Table 6) with a mean of 3.18 ng/kg. All values were below Health & Welfare Canada's guideline for consumption of sportfish (TEQ 15 ng/kg).

Table 6. Concentrations (ng/kg) of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans in walleye collected from Lake St. Francis at the Raisin River, April 1990 (Environment Ontario & OMNR Data Files). Five walleye were analyzed.

Parameter	Concentration in Walleye (ng/kg)				
Sample Size (g)	20.83	20.24	20.91	21.04	20.88
Length of Fish (cm)	70.3	70.6	72.0	72.9	73.1
T4CDD	4.4[1]	3.8[1]	2.5[1]	ND(1)	ND(1)
P5CDD	1.3[1]	4.0[2]	1.4[1]	ND(1)	ND(2)
H6CDD	ND(1)	1.2[1]	ND(1)	ND(1)	ND(1)
H7CDD	0.7[1]	ND(2)	0.6[1]	0.7[1]	ND(1)
O8CDD	ND(1)	3.7[1]	ND(1)	2.9[1]	ND(2)
T4CDF	4.0[1]	3.0[1]	4.3[1]	0.9[1]	ND(1)
PFCDF	3.4[2]	1.5[1]	2.7[2]	ND(1)	ND(1)
H6CDF	1.4[2]	1.1[1]	ND(1)	ND(1)	ND(1)
H7CDF	2.9[3]	5.5[1]	ND(1)	ND(1)	ND(2)
O8CDF	ND(1)	ND(2)	ND(1)	ND(2)	ND(1)
2,3,7,8-Substituted Isomers					
2,3,7,8-TCDD	4.4	3.8	2.5	ND(1)	ND(1)
1,2,3,7,8-PCDD	1.3	2.7	1.4	ND(1)	ND(2)
H6CDD**	ND(1)	1.1	ND(0.6)	ND(1)	ND(1)
1,2,3,4,6,7,8-H7CDD	0.7	ND(2)	0.6	0.7	ND(1)
1,2,3,4,6,7,8,9-OCDD	ND(1)	3.7	ND(1)	2.9	ND(2)
2,3,7,8-TCDF	4.0	3.0	4.3	0.9	ND(1)
2,3,4,7,8-PCDF	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(1)
1,2,3,7,8-PCDF	2.2	1.5	1.1	ND(1)	ND(1)
H6CDF***	0.5	1.1	ND(1)	ND(1)	ND(1)
1,2,3,4,6,7,8-H7CDF	1.8	5.5	ND(1)	ND(1)	ND(2)
1,2,3,4,7,8,9-H7CDF	ND(0.5)	ND(0.5)	ND(0.5)	ND(1)	ND(2)
1,2,3,4,6,7,8,9-OCDF	ND(1)	ND(2)	ND(1)	ND(1)	ND(1)
Surrogate Standard Recovery (%)					
$^{12}C_{13}$-T4CDD	58	11	63	51	62
$^{12}C_{13}$-P5CDD	66	50	76	56	62
$^{12}C_{13}$-H6CDD	89	64	100	67	74
$^{12}C_{13}$-H7CDD	62	16	70	43	46
$^{12}C_{13}$-O8CDD	77	34	86	48	49
Toxic Equivalent (TEQ)					
TEQ	5.79	6.30	3.69	0.10	ND

** All three H6CDD isomers have the same TEF, so they are reported as a sum.

*** All four H6CDF isomers have the same TEF, so they are reported as a sum.

ND Not detected. Detection limit in ng/kg shown in parentheses.

[1] Superscripts indicate the number of isomers detected.

Note: Health & Welfare Canada dioxins & furans Guideline for Consumption of Sportfish is TEQ 15 ng/kg.

The five fish tissue samples analyzed for dioxins and furans were also tested for PAHs. Results are listed in Table 7. Fluorene, phenanthrene, fluoranthene and pyrene were found in all samples. Phenanthrene was present at the highest concentrations, ranging from 0.078 to 0.241 mg/kg. Benzo(a)pyrene, a known carcinogen, was not detected in walleye tissue (Table 7).

Table 7. Concentrations (mg/kg) of polycyclic aromatic hydrocarbons (PAHs) in walleye collected from Lake St. Francis at the Raisin River, April 1990 (Environment Ontario & OMNR Data Files).

Parameter	Sample Number				
	1	2	3	4	5
Length (cm)	70.3	70.6	72.0	72.9	73.1
% Lipid	4.08	0.36	6.21	0.31	1.84
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND
Napthalene	ND	ND	0.035	0.020	0.028
Acenapthylene	ND	ND	ND	ND	ND
Acenapthene	ND	ND	0.025	00.022	0.022
Fluorene	0.029	0.019	0.050	0.039	0.040
Phenanthrene	0.078	0.078	0.241	0.212	0.210
Anthracene	ND	ND	0.012	0.013	0.014
Fluoranthene	0.016	0.016	0.042	0.037	0.036
Pyrene	0.009	0.010	0.031	0.021	0.021
Benzo(a)anthracene	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)pyrene	ND	ND	ND	ND	ND

Fish collections taken from Lake St. Francis at the Raisin River in 1990 were also analyzed for heavy metals and pesticides. Heavy metals were detected in all fish tissue samples. Levels of zinc were the highest, ranging from 2.4 to 6.2 mg/kg (Table 8). Heptachlor and *p,p'*-DDE were found in all walleye tissue samples. Mirex concentrations were highest at the Raisin River site (Table 5). Hexachlorobenzene and octachlorostyrene were detected in 85% of the fish tissue samples.

The following organochlorine compounds were not detected in 1990 walleye collections from Lake St. Francis: 2,4,6-trichlorophenol, 2,4,5-trichlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,3,4,5-tetrachlorophenol, pentachlorophenol, hexachloroethane, 1,3,5-trichlorobenzene, 1,2,4-trichlorobenzene, hexachlorobutadiene, 1,2,3-trichlorobenzene, 2,4,5-trichlorotoluene, 2,3,6-trichlorotoluene, 1,2,4,5-tetrachlorobenzene, 1,2,3,4-tetrachlorobenzene and pentachlorobenzene (Environment Ontario & OMNR Data Files).

Table 8. Mean and range of pesticide and metal concentrations (mg/kg) in 20 tissue samples of walleye collected from Lake St. Francis at the Raisin River in 1990. Walleye lengths ranged from 42.8 to 69.9 cm with a mean of 60.8 cm (Environment Ontario & OMNR Data Files).

Pesticides		Metals	
Parameter	Concentration (mg/kg)	Parameter	Concentration (mg/kg)
Hexachlorobenzene	0.0026 (ND-0.006)	Copper	0.28 (<0.20-0.53)
Heptachlor	0.020 (0.006-0.057)	Nickel	0.51 (<0.40-0.96)
Aldrin	0.0025 (ND-0.005)	Zinc	3.4 (2.4-6.2)
p,p'-DDE*	0.363 (0.011-1.02)	Lead**	<0.60 (<0.60-<0.70)
α-Chlordane	0.007 (ND-0.017)	Cadmium	<0.04 (<0.04-0.07)
γ-Chlordane	0.004 (ND-0.005)	Manganese	<0.20 (<0.20-<0.30)
o,p'-DDT*	0.0297 (ND-0.033)	Arsenic	0.08 (0.03-0.11)
p,p'-DDD*	0.0123 (ND-0.024)	Selenium	0.41 (0.18-0.59)
p,p'-DDT*	0.0122 (ND-0.027		
Octachlorostyrene	0.008 (ND-0.013)		

* Health & Welfare Canada consumption limit for DDT and its metabolites in fish is 5 mg/kg muscle tissue (wet weight).

** Health & Welfare Canada consumption limit for lead in fish is 1 mg/kg muscle tissue (wet weight).

7.9 Addendum to Section 6.3.4.3, Wildlife

Breast muscle of waterfowl from Lake St. Francis, collected in the fall of 1989 by the Canadian Wildlife Service, was analyzed for organochlorine contaminants (Table 9). Except for hexachlorobenzene (HCB), all organochlorine contaminants detected in mallard breast muscle in 1988 had either decreased in concentration or were not detected in 1989 collections. Mean HCB levels in breast muscle of adult and immature mallards increased from 0.4 ng/g in 1988 to 1.3 ng/g in 1989.

Table 9. Mean concentration of organochlorine contaminants (ng/g wet weight) in breast muscle from Lake St. Francis waterfowl collected during the Fall, 1989 (local and migrating birds combined) (Canadian Wildlife Service Data Files).

Parameter	Species				
	Mallard	Mallard	Gadwall	Lesser Scaup	Greater Scaup
Age	adult	mixed	immature	immature	immature
Sex	mixed	mixed	female	mixed	mixed
Sample Size	8	7	2	2	2
% Lipid	2.08	2.98	1.75	2.73	2.77
% Water	73.1	71.7	75.6	72.6	75.0
1,2,4,5-Tetrachlorobenzene	ND	ND	ND	ND	ND
1,2,3,4-Tetrachlorobenzene	ND	ND	ND	ND	ND
Pentachlorobenzene	4.8	ND	ND	ND	ND
HCB	1.3	ND	ND	ND	2.8
α-HCH	ND	ND	ND	ND	ND
β-HCH	ND	ND	ND	ND	ND
γ-HCH (lindane)	ND	ND	ND	ND	ND
OCS (octachlorostyrene)	ND	ND	ND	ND	ND
oxy-chlordane	ND	ND	ND	ND	2.0
trans-chlordane	ND	ND	ND	ND	ND
cis-chlordane	ND	ND	1.1	ND	ND
trans-nonachlor	ND	ND	ND	ND	ND
cis-nonachlor	ND	ND	ND	ND	ND
p,p'-DDE	5.9	1.1	ND	9.8	88.4
p,p'-DDD	ND	ND	ND	ND	ND
p,p'-DDT	ND	ND	ND	ND	ND
Photo-mirex	ND	ND	ND	ND	ND
Mirex	ND	ND	ND	1.3	2.9
Heptachlor epoxide	ND	ND	ND	ND	1.2
Dieldrin	ND	ND	1.7	14.4	ND
PCBs (Arochlor 1254:1260)	29.4	8.5	5.4	18.2	558.6

ND mean <1 ng/g wet weight

7.10 New Section 6.3.5, 1988 Caged Mussel (*Elliptio complanata*) Study

In June 1988 the Ontario Ministry of the Environment conducted a caged mussel study in the St. Lawrence River AOC. The results presented here have not yet been incorporated into a formal report. Caged mussels (*Elliptio complanata*) were placed at twelve locations within the AOC (Table 10) for a period of three weeks. They were then retrieved, shucked, rinsed and frozen until analysis. Preliminary results for metals, PAHs and pesticides are shown in Tables 10, 11 and 12 respectively. Chlorinated benzenes and chlorinated phenols were not detected in the caged mussels.

Table 10. Metal concentrations ($\mu g/g$ wet wt) in caged mussels from the St. Lawrence River. Samples were placed in cages for three weeks during 1988 at specified locations (Environment Ontario preliminary results).

Station	Arsenic	Cadmium	Copper	Mercury	Manganese	Nickel	Lead	Selenium	Zinc
Downstream of Reynolds outfall	-	0.520	1.50	.	269.00	0.600	0.90	-	38.00
Downstream of Reynolds outfall	0.11	0.560	0.84	-	217.00	0.300	0.40	0.46	21.00
Mouth of Raisin River	-	0.520	0.86	.	148.00	0.500	0.70	-	56.00
Mouth of Raisin River	0.07	0.420	0.56	-	267.00	0.400	0.50	0.54	43.00
In Bay at St. Regis	-	1.000	0.70	.	331.00	0.400	0.60	-	21.00
In Bay at St. Regis	0.04	0.680	0.56	-	274.00	0.500	0.60	0.40	22.00
Raquette River	-	0.940	0.76	.	212.00	0.500	0.70	-	43.00
Raquette River	0.07	0.500	0.39	-	203.00	0.500	0.60	0.36	24.00
South side, Pilon Is.	0.09	0.820	0.17	-	278.00	0.400	0.50	0.46	25.00
South side, Pilon Is.	-	0.840	0.92	.	293.00	0.600	0.80	-	36.00
Downstream of Courtaulds	-	0.420	0.74	0.08	230.00	0.500	0.70	-	68.00
Downstream of Courtaulds	0.63	0.900	1.10	-	403.00	0.400	0.50	1.20	69.00
MacDonnell Is. (control site)	-	0.720	0.76	0.10	178.00	0.500	0.70	-	18.00
MacDonnell Is. (control site)	0.53	0.840	0.84	-	61.00	0.400	0.60	1.40	34.00
North Channel below power dam	-	0.650	1.20	0.03	172.00	0.400	0.60	-	21.00
North Channel below power dam	0.65	0.770	1.30	-	136.00	0.400	0.50	1.50	19.00
Downstream of GM outfall	-	1.100	0.84	0.06	172.00	0.500	0.80	-	35.00
Downstream of GM outfall	0.32	0.350	0.20	-	412.00	0.400	0.50	1.00	31.00
Oil tank storage area	-	0.490	0.88	0.07	338.00	0.600	0.70	-	31.00
Oil tank storage area	0.80	0.430	0.88	-	390.00	0.500	0.60	1.00	24.00
Grasse River	-	0.340	0.88	0.14	187.00	0.400	0.60	-	33.00
Grasse River	0.11	0.350	1.40	-	134.00	0.400	0.60	0.43	21.00
Cornwall Canal	-	0.620	1.00	0.02	267.00	0.500	0.70	-	20.00
Cornwall Canal	0.57	0.620	0.67	-	50.00	0.400	0.60	1.80	33.00

\- Data not available
. Below detection limit

Table 11. Polycyclic aromatic hydrocarbon (PAH) concentrations (ng/g wet wt) in caged mussels from the St. Lawrence River. Samples were placed in cages for three weeks in 1988 at specified locations (Environment Ontario preliminary results).

Station	ACNE	ACNY	ANTH	BAA	BAP	BBF	BKF	CHRY	DAHA	FLAN	FLUO	GHIP	INP	NAPH	PHEN	PYR
Downstream of Reynolds outfall	12	7	10	475	242	225	.	970	41	112	21	138	115	26	173	108
Mouth of Raisin River	.	.	.	.	.	.	.	14	.	20	.	.	.	24	32	16
In bay at St. Regis	8	.	.	.	.	.	.	13	.	13	.	.	.	28	26	10
Raquette River	8	.	.	.	.	.	.	12	.	16	.	.	.	22	39	13
South side of Pilon Island	8	.	.	8	.	.	.	30	.	40	.	.	.	34	49	27
Downstream of Courtaulds	.	.	.	10	.	20	.	29	.	33	.	.	.	22	48	26
MacDonnell Is. (control site)	8	.	.	.	.	.	.	.	.	11	.	.	.	27	29	8
North Channel below power dam	.	.	.	.	.	.	.	.	.	.	.	.	.	24	32	.
Downstream of GM outfall	.	.	.	6	.	19	.	20	.	20	.	.	.	25	35	18
Oil tank storage area	9	.	.	24	14	290	.	421	.	102	.	51	.	.	35	81
Grasse River	8	.	.	14	.	81	.	126	.	58	.	.	.	28	48	43
Cornwall Canal	.	.	.	.	.	.	.	20	.	26	.	.	.	34	40	19

. Below Detection Limit

ACNE = acenapthene
ACNY = acenaphthylene
ANTH = anthracene
BAA = benzo(a)anthracene
BAP = benzo(a)pyrene
BBF = benzo(b)fluoranthene
BKF = benzo(k)fluoranthene
CHRY = chrysene
DAHA = dibenzo(a,h)anthracene
FLAN = fluoranthene
FLUO = fluorene
GHIP = benzo(g,h,i)perylene
INP = indeno(1,2,3-c,d)pyrene
NAPH = napthalene
PHEN = phenanthrene
PYR = pyrene

Table 12. Detectable PCB and pesticide concentrations (ng/g) wet weight in caged mussels from the St. Lawrence River. Samples were placed in cages for three weeks in 1988 at specified locations (Environment Ontario preliminary results).

Station	αBHC	γ-Chl	Hept	OCS	Total PCB	p,p'-DDD	p,p'-DDE	p,p'-DDT	HCB
Downstream of Reynolds outfall	.	.	.	.	340*	.	.	.	.
Downstream of Reynolds outfall	.	.	.	10.0	290**	6.0	.	11.0	.
Mouth of Raisin River	.	.	.	.	.	.	5.0	.	.
Mouth of Raisin River	.	.	.	.	.	.	.	.	.
In bay at St. Regis	.	.	.	.	.	.	.	.	.
In bay at St. Regis	.	.	.	.	.	.	.	.	.
Raquette River	.	.	.	.	.	.	4.0	.	.
Raquette River	.	.	3.0	.	.	.	.	.	.
South side, Pilon Is.	.	.	.	.	.	.	.	.	.
South side, Pilon Is.	.	.	.	.	.	.	.	.	2.0
Downstream of Courtaulds	.	.	.	.	.	.	.	.	.
Downstream of Courtaulds	.	.	.	.	.	.	.	.	.
MacDonnell Is. (control site)	.	.	.	.	.	.	.	.	.
MacDonnell Is. (control site)	.	.	.	.	.	.	2.0	.	.
North Channel below power dam	.	.	.	.	.	.	.	.	.
North Channel below power dam	.	.	.	.	.	.	.	.	.
Downstream of GM outfall	5.0	.	.	10.0	180*	.	2.0	.	.
Downstream of GM outfall	.	.	.	8.0	440**	.	.	.	.
Oil tank storage area	-	-	-	-	-	-	-	-	-
Oil tank storage area	.	.	.	.	.	.	.	.	.
Grasse River	.	.	.	3.0	700*	.	.	.	.
Grasse River	.	5.0	.	10.0	410**	.	.	.	.
Cornwall Canal	.	.	.	.	.	.	.	.	.
Cornwall Canal	.	.	.	.	.	.	3.0	.	.

* Mixture Arochlor 1254,1260
** Mixture Arochlor 1254
. Below Detection Limit
- Data Not Available
γ-Chl γ-Chlordane
Hept Heptachlor
OCS Octachlorostyrene
PCB Polychlorinated biphenyls
HCB Hexachlorobenzene

7.11 New Section 6.3.6, 1991 Zebra Mussel Monitoring Program

Zebra mussels (*Dreissena polymorpha (Pallus)*) were first reported in the St. Lawrence River in 1989 at Cornwall and Massena following their introduction to Lake St. Clair in 1988. A zebra mussel monitoring program was initiated in 1990 in the St. Lawrence River by the Ontario Ministry of Natural Resources (OMNR) and the New York State Department of Environmental Conservation (NYSDEC). In 1990 zebra mussels were found at the Canada Coast Guard harbour in Prescott and on navigational aids from the Eisenhower Lock (Massena, NY) downstream to Cornwall, Ontario (Hendrick *et al.* 1992). In 1991, a more intensive monitoring program was implemented to detect the presence and abundance of zebra mussels in other sections of the river. Additional settling plate stations were added, diving surveys conducted and pumping stations established for the detection of larval zebra mussels. Navigational aids (buoys) throughout the river were examined following their removal in the fall.

Larval zebra mussels were detected in only one sample (5.3 larvae/m^3) at Iroquois, located upstream of the St. Lawrence AOC. Zebra mussels were not found on any of the settling plates. Divers documented zebra mussels at island stations off Clayton and Chippewa Bay at densities of 1/m^2 and 5-10/m^2 respectively. Zebra mussels were not found by divers at Ogdensburg. In Ontario, thirty-two percent (64) of the 201 navigational aids inspected had zebra mussels attached to them. The middle corridor (upstream of the AOC) was the only section of the river in which buoys did not harbour zebra mussels. The greatest numbers of zebra mussels were found in Lake St. Francis (64 buoys, 86%). In New York, zebra mussels were found on seventy-three percent (78) of 107 buoys inspected from Lake Ontario to Massena. The percent of buoys downstream from Massena with zebra mussels increased from 71% in 1990 to 100% in 1991.

A new species of mussel, the quagga mussel (*Dreissena sp.*), was collected from the buoys in New York waters and from 1992 sampling plates at Long Sault. This was the first report of quagga mussels in the St. Lawrence River. Quagga mussels were found only as far as 140 km downstream of Lake Ontario, whereas zebra mussels were found an additional 40 km downstream.

In addition to this monitoring program, other sources (OMNR 1991 netting survey, Environment Canada 1991 diving survey and water intake surveys at Kingston and several New York municipalities) have reported the presence of zebra mussels. Hendrick *et al.* (1992) concluded that in 1991 zebra mussels occurred in all sections of the St. Lawrence River, as compared to 1990 when they were documented only in the Cornwall/Massena and Prescott areas.

The zebra mussel monitoring program is ongoing, but it is apparent that the abundance of zebra mussels is increasing and they are becoming more widely distributed. To date, no specific impacts on other ecosystem components have been detected.

8.0 ADDENDUM TO CHAPTER 7: Description of Sources

8.1 Errata

Page 7-17, first paragraph, first sentence should read: "Monitoring by Environment Ontario showed that soil mercury concentrations decrease to background values within about 1 km of the plant."

8.2 Update of Table 7-1

Table 7-1. Typical characteristics of Cornwall industrial discharges (1988) (Environment Ontario Data Files, Cornwall Office; Anderson and Biberhofer 1991).

Facility and Parameters	Range	Average	Average Loading* (kg/day)
Domtar Clarifier Effluent			
Flow	-	-	NA
BOD_5	100-300 mg/L	150 mg/L	
COD	300-900 mg/L	480 mg/L	
Suspended Solids	40-150 mg/L	80 mg/L	
Total Dissolved Solids	800-1,500 mg/L	950 mg/L	
Domtar Bypass Effluent			
Flow	-	-	NA
BOD_5	50-1200 mg/L	200 mg/L	
COD	100-3,000 mg/L	800 mg/L	
Suspended Solids	5-150 mg/L	25 mg/L	
Total Dissolved Solids	300-3,500 mg/L	850 mg/L	
ICI Forest Products (formerly CIL)			
Flow	2,500-4,500 m^3/day	3,100 m^3/day	12.4
BOD_5	Less than 1 to 20 mg/L	4 mg/L	248
COD	10-300 mg/L	80 mg/L	279
Suspended Solids	20-200 mg/L	90 mg/L	8370
Total Dissolved Solids	1,500-5,000 mg/L	2,700 mg/L	0.043
Mercury	0.006-0.100 mg/L	0.014 mg/L	
Cornwall Chemicals			
Flow	-	850 m^3/day	
BOD_5	10-250 mg/L	105 mg/L	89.25
COD	30-350 mg/L	210 mg/L	178.5
Suspended Solids	2-25 mg/L	10 mg/L	8.5
Total Dissolved Solids	1,500-4,000 mg/L	2,500 mg/L	2125.0
Courtaulds – BCL Acid Sewer			
Flow	4,500-9,000 m^3/day	7,500 m^3/day	
BOD_5	100-300 mg/L	180 mg/L	1350
COD	200-800 mg/L	400 mg/L	3000
Suspended Solids	20-250 mg/L	100 mg/L	750
Courtaulds – BCL Viscose Sewer			
Flow	1,000-5,000 m^3/day	2,500 m^3/day	
BOD_5	200-500 mg/L	300 mg/L	750
COD	200-1,200 mg/L	600 mg/L	1500
Suspended Solids	30-500 mg/L	100 mg/L	250
Courtaulds – BCL Sulphide Sewer			
Flow	1,000-2,500 m^3/day	1,500 m^3/day	
BOD_5	20-200 mg/L	50 mg/L	75
Suspended Solids	1-20 mg/L	4 mg/L	6
Cornwall WPCP**			
Flow	30,240-66,780 m^3/day	48,550 m^3/day	
BOD_5	ND-110.0 mg/L	45.9 mg/L	2228.5
Suspended Solids	15.0-29.0 mg/L	21.1 mg/L	1024.41
Total Phosphorus	0.8-1.1 mg/L	0.9 mg/L	43.70

* LOADING (kg/day) = FLOW (m^3/day) X CONCENTRATION (mg/L) X 10^{-3}

** 1988 Data (Environment Ontario 1989)

NA data unavailable

8.3 Loadings of BOD and TSS from Industries Compared with Loadings from Cornwall WPCP

The contributions of contaminants by various dischargers can be assessed by comparing them to the contribution from the municipal sewage treatment plant, which serves a known population. This is done by converting industrial loadings to population equivalents. In this AOC, the Cornwall WPCP serves a population of 46,800. Using this information, one can calculate a population equivalent for each industrial discharger using the following equation. The results are shown in Table 13.

$$PE = \frac{PC \times IL}{ML}$$

where,

PE = Population equivalent
PC = Population served by Cornwall WPCP (46,800 in 1988)
IL = Contaminant loading (kg/day) from an industrial discharge
ML = Contaminant loading (kg/day) from municipal discharge (Cornwall WPCP)
(**Note:** Loading for IL and ML must be for the same contaminant).

Table 13. Population equivalent with respect to the Cornwall WPCP for industries discharging to the St. Lawrence River Area of Concern (1988 unless otherwise noted).

Facility and Parameter	Annual Average Loading (kg/day)	Population Equivalent
Cornwall WPCP		
BOD_5	2,228.5	46,800
TSS	1,024.41	46,800
Domtar (1990)		
BOD_5	20,846.5	437,791
TSS	9,752.5	445,541
ICI Forest Products (formerly CIL)		
BOD_5	12.4	260
TSS	279	12,746
Cornwall Chemicals		
BOD_5	89.25	1,874
TSS	8.5	388
Courtaulds - BCL Acid Sewer		
BOD_5	1359	28,540
TSS	750	34,264
BCL - Viscose Sewer		
BOD_5	750	15,751
TSS	1500	68,527
BCL - Sulphide Sewer		
BOD_5	75	1,575
TSS	6	274

8.4 Addendum to Section 7.1.1, Domtar Fine Papers Inc.

Erratum: page 7-4, paragraph 4: "This information shows that the soluble component of the Domtar effluent is a complex mixture of organic compounds (Appendix VII, Stage 1 Report). Resin and fatty acid concentrations are particularly high with 1981 levels averaging 1.90 mg/L total resin acids and 2.69 mg/L total fatty acids (Appendix VII, Stage 1 Report). Phenolic compounds, which can impart off-tastes to fish are also present in appreciable amounts. Phenol concentrations in 1981 averaged 0.207 mg/L (Appendix VII, Stage 1 Report)."

MISA preliminary reports have been released for both the first and second six months of process effluent monitoring for the pulp and paper industry during 1990. Priority pollutants detected in Domtar's process effluent are listed in Table 14. A comparison with the 1987 MISA pre-regulation monitoring results (Appendix VII, Stage 1 Report) shows that average concentrations of metals either decreased or remained the same. Average concentrations of volatiles increased. Concentrations of benzene, chloroform and toluene increased 2- to 5-fold between 1987 and 1990.

Resin and fatty acids continued to be present in the effluent. 1981 concentrations of dehyroabietic acid averaged 0.733 mg/L and 1990 values were slightly lower at an annual average of 0.465 mg/L (Appendix VII, Stage 1 Report and Table 14). Abietic acid average concentrations decreased from 1.14 mg/L in 1981 to 0.19 mg/L in 1990.

Except for anthracene and napthalene, average concentrations of several PAHs increased between 1987 and 1990. Benzo(a)pyrene, a known carcinogen, was detected in 17% of the samples in the last half of 1990 at an average concentration of 0.00012 mg/L. Benzo(a)pyrene was not tested for in the 1987 survey.

Between 1987 and 1990, annual average concentrations of BOD_5 and total suspended solids increased from 132.8 mg/L to 162.0 mg/L for BOD_5, and from 53.3 mg/L to 75.69 mg/L for total suspended solids. Both parameters exceeded the Ontario Industrial Effluent Objectives of 15 mg/L for BOD_5 and 15 mg/L for total suspended solids. Average cadmium levels had decreased by 1990 to 0.00067 mg/L, and no longer exceed the Ontario Industrial Effluent Objective of 0.001 mg/L. This objective was exceeded during the 1987 sampling (average Cd concentration of 0.0011 mg/L).

Adsorbable organic halogens (AOX) is a measure of the concentration of chlorinated organic contaminants. AOX results for Domtar in 1988 and 1989 are shown in Table 15 and 1990 results in Table 14. AOX levels in final process effluent were highest in July/August 1988 at 7.3 mg/L (Table 15) but by November/December 1988 had decreased by one-half to 3.4 mg/L and remained at this level through 1990. In 1990 AOX concentrations ranged from 0.04 to 5.9 mg/L with a 1990 annual average of 3.31 mg/L. AOX loadings were 401 kg/day for the first six months of 1990 and 461 kg/day for the last six months of 1990 (Table 16) with an annual average of 431 kg/day.

Octachlorodibenzo-p-dioxin and total TCDF (furan) were detected in all Domtar process effluent samples during the 1990 MISA survey (Table 14). Octachlorodibenzo-p-dioxin levels ranged from 0.06 to 0.37 ng/L. Total TCDF concentrations ranged from 0.01 to 0.1 ng/L. Two additional dioxin compounds, total H6CDD and total H7CDD were found in 20% of the samples collected during the last six months of 1990 (Table 14). Concentrations ranged from ND to 0.10 ng/L for both H6CDD and H7CDD.

Table 14. Priority pollutants detected in process effluent at Domtar Inc., Fine Papers Division, Cornwall. Preliminary results are from MISA samples collected January through June, 1990 and July through December, 1990 (Environment Ontario 1990a, 1990b).

Parameter	January through June, 1990		July through December, 1990	
	Percent Frequency of Detection*	Concentration (mg/L) range and mean	Percent Frequency of Detection*	Concentration (mg/L) range and mean
Abietic Acid	100	0.06 - 0.26 0.17	100	0.9 - 0.38 0.21
Adsorbable Organic Halide (AOX)	100	0.14 - 5.30 3.17	100	0.04 - 5.90 3.45
Aluminum	100	0.490 - 2.020 1.332	100	0.890 - 8.59 1.843
BOD, 5 day, Total Demand	100	100.0 - 256.0 174.38	100	57.0 - 222.0 149.68
Benzene	100	0.0044 - 0.0125 0.00797	100	0.0058 - 0.0332 0.01297
COD	100	230.0 - 855.0 510.55	100	185.0 - 789.0 424.96
Chlorodehydroabietic Acid	100	0.01 - 0.09 0.04	100	0.02 - 0.08 0.04
Chloroform	100	0.137 - 0.349 0.2372	100	0.182 - 0.348 0.2405
Dehydroabietic Acid	100	0.19 - 0.80 0.46	100	0.17 - 1.26 0.47
Hydrogen Ion (pH)	100	5.55 - 9.39 7.19	100	6.11 - 9.30 7.27
Levopimaric Acid	100	0.01 - 0.01 0.01	67	0.00 - 0.04 0.02
Nitrate + Nitrite	100	0.03 - 0.55 0.19	100	0.05 - 0.99 0.32
Octachlorodibenzo-p-dioxin	100	0.09 - 0.37 ng/L 0.19 ng/L	100	0.06 - 0.31 ng/L 0.14 ng/L
Oleic Acid	100	0.01 - 0.15 0.06	100	0.08 - 0.19 0.14
Phenol	100	0.0196 - 0.186 0.1082	100	0.0656 - 0.143 0.09885
Specific Conductance	100	481.0 - 1,472.0 µsiem/cm 1,124.36 µsiem/cm	100	484.0 - 1,405.0 µsiem/cm 1,056.02 µsiem/cm
Sulphide	100	0.02 - 0.95 0.29	100	0.09 - 0.75 0.39
Toluene	100	0.0035 - 0.0081 0.00562	67	0.00 - 0.013 0.0055
Total Kjeldahl Nitrogen	100	1.30 - 4.00 2.82	100	2.80 - 6.00 3.82

Table 14 (Cont'd)

Parameter	January through June, 1990		July through December, 1990	
	Percent Frequency of Detection*	Concentration (mg/L) range and mean	Percent Frequency of Detection*	Concentration (mg/L) range and mean
Total TCDF	100	0.01 - 0.10 ng/L 0.04 ng/L	100	0.02 - 0.08 ng/L 0.05 ng/L
Total Phosphorus	100	0.22 - 0.50 0.34	100	0.23 - 0.50 0.34
Total Suspended Solids	100	41.0 - 152.0 79.31	100	39.0 - 152.0 72.06
Zinc	100	0.020 - 0.080 0.0452	100	0.020 - 0.070 0.0446
Ammonia plus Ammonium	83	0.00 - 1.13 0.62	67	0.00 - 1.48 0.30
Phenanthrene	83	0.00 - 0.0199 0.00977	100	0.0062 - 0.0242 0.01192
Neoabietic Acid	83	0.00 - 0.10 0.05	67	0.00 - 0.18 0,08
Styrene	83	0.00 - 0.0049 0.00343	ND	ND
Copper	67	0.00 - 0.010 0.00667	50	0.00 - 0.030 0.010
Fluoranthene	67	0.00 - 0.009 0.00328	67	0.00 - 0.0098 0.00337
Isopimaric Acid	67	0.00 - 0.01 0.01	67	0.00 - 0.04 0.01
Pimaric Acid	67	0.00 - 0.01 0.01	33	0.00 - 0.01 0.00
Pyrene	67	0.00 - 0.0066 0.0021	50	0.00 - 0.0049 0.00142
Acenaphthylene	50	0.00 - 0.0054 0.0019	50	0.00 - 0.0063 0.00262
Chromium	50	0.00 - 0.020 0.010	ND	ND
Naphthalene	50	0.00 - 0.0086 0.0033	50	0.00 - 0.0105 0.00448
Dichlorodehydroabietic Acid	42	0.00 - 0.13 0.01	19	0.00 - 0.10 0.01
1,2,4-Trichlorobenzene	33	0.00 - 0.00001 0.00	17	0.00 - 0.00001 0.00
Bromodichloromethane	33	0.00 - 0.0037 0.00092	ND	ND
Chrysene	33	0.00 - 0.0017 0.00047	33	0.00 - 0.0028 0.00088

Table 14 (Cont'd)

Parameter	January through June, 1990		July through December, 1990	
	Percent Frequency of Detection*	Concentration (mg/L) range and mean	Percent Frequency of Detection*	Concentration (mg/L) range and mean
Vanadium	33	0.00 - 0.020 0.00667	ND	ND
o-Cresol	33	0.00 - 0.0082 0.00233	50	0.00 - 0.0071 0.00303
Mercury	20	0.00 - 0.00009 0.00002	17	0.00 - 0.00015 0.00002
1,2,3,5-Tetrachlorobenzene	0	ND	33	0.00 - 0.00001 0.00
Total H6CDD	0	ND	20	0.00 - 0.10 ng/L 0.02 ng/L
Total H7CDD	17	0.00 - 0.05 ng/L 0.01 ng/L	20	0.00 - 0.10 ng/L 0.02 ng/L
1,2,4,5-Tetrachlorobenzene	0	ND	17	0.00 - 0.00002 0.00
1,2,4-Trichlorobenzene	0	ND	17	0.00 - 0.00001 0.00
Anthracene	17	00.00 - 0.0016 0.00027	17	0.00 - 0.0025 0.00042
Benz(a)anthracene	17	0.00 - 0.0009 0.00015	17	0.00 - 0.0019 0.00032
Benzo(a)pyrene	0	ND	17	0.00 - 0.0007 0.00012
Benzo(b)fluoranthene	0	ND	17	0.00 - 0.0018 0.0003
Benzo(k)fluoranthene	0	ND	17	0.00 - 0.0018 0.0003
Fluorene	0	ND	17	0.00 - 0.0013 0.00022
Cadmium	17	0.00 - 0.004 0.00067	ND	ND
Indole	17	0.00 - 0.0056 0.00093	ND	ND

* Percent frequency of detection above the laboratory method detection limit

Note: Values below the detection limit are treated as zero

Table 15. Baseline levels of Adsorbable Organic Halogens (AOX) in wastewaters from Domtar Fine Papers, Cornwall from July 1988 to May 1989 (Garden and Tseng 1990).

Mill-Sampling Round (Date)	Bleached Kraft Production (ADT/day)	Soft Wood (%)	Total Final Effluent (m^3/day)	Final AOX Concentration (mg/L)	kg AOX per ADT
July-August 1988	441	0	105,440 (process) 11,230 (by-pass)	7.3 0.2	1.8
November-December 1988	429	0	106,350 (process) 9,905 (by-pass)	3.4 0.3	0.8
April-May 1989	459	0	103,170 (process) 7,950 (by-pass)	3.1 0.2	0.7

ADT Air Dried Tonnes

Table 16. Average daily loading (kg/day) for daily, thrice weekly and weekly parameters in the Domtar Inc. (Cornwall) process effluent stream. Loading results are from MISA samples collected January through June, 1990 and July through December, 1990 (Environment Ontario 1990a, 1990b).

Parameter	Loading (kg/day)	
	January through June 1990	July through December 1990
Aluminum	170.1	244.9
AOX	401	461
BOD5	21,869	19,824
COD	64,413	56,325
Ammonia + Ammonium	77.9	38.5
Nitrate + Nitrite	23.0	41.6
Total Kjeldahl Nitrogen	355.1	505.5
Phosphorus	42.6	44.9
Dichlorodehydroabietic Acid	1.8	0.9
Dehydroabietic Acid	57.8	61.0
Total Suspended Solids	10,011	9,494
Zinc	5.7	5.9

8.5 Addendum to Section 7.1.2, ICI Forest Products (formerly CIL)-Cornwall Chemicals-Stanchem

The effluents from ICI Forest Products (formerly CIL), Cornwall Chemicals and Stanchem are combined prior to discharge. The flow from these three facilities totals about 4,000 m^3/day and is characterized by its low BOD_5 and suspended solids (Table 7-1, Appendices VIII, IX and X, Stage 1 Report). This effluent is discharged directly to the St. Lawrence River through the Domtar diffuser.

ICI Forest Products (formerly CIL)

At ICI Forest Products (formerly CIL), salt is dissolved and converted into sodium hydroxide and chlorine by electrolysis, using the mercury cell process. This process results in four effluent streams. Only one effluent stream, which is most likely to be contaminated by mercury, is treated. Effluent streams from storage area runoff, recirculated cooling water blowdown and filter backwash are not treated but are combined with the treated effluent prior to discharge.

The amount of mercury lost in liquid effluents and air emissions between 1982 and 1991 is shown in Table 17. Air emissions steadily increased from 1984 through 1990 then abruptly decreased in 1991 from 99.9 kg to 69.4 kg (Table 17). Mercury losses in effluent have remained relatively constant with minor fluctuations from

Table 17. Amount of mercury (kg) lost through liquid effluents and air emissions at ICI Forest Products from January 1982 through December 1991 (Canadian Chemical Producers' Association Annual Reports 1982 through 1991).

Year	Amount of Mercury Lost in Liquid Effluents (kg)	Amount of Mercury Lost in Air Emissions (kg)
1982	12.9	89.6
1983	12.7	69.1
1984	12.3	58.0
1985	15.5	60.2
1986	15.6	85.7
1987	11.7	88.6
1988	14.8	92.7
1989	12.0	91.6
1990	18.2	99.9
1991	8.8	69.4

1982 through 1990 (Table 17). In 1991, the amount of mercury lost in effluent decreased by nearly half that reported in previous years (Table 17). The amount of mercury discharged meets the federal Chlor-Alkali Regulation (0.0025 kg Hg per tonne of chlorine produced). In 1992 the average daily discharge of mercury in effluent was 0.022 kg/day and air emissions averaged 0.220 kg/day (ICI information sheet, November 1992).

Appendix IX (Stage 1 Report) shows the results of Environment Ontario's MISA pre-regulation monitoring. Concentrations of most persistent and problem compounds were very low in ICI effluent, with the exception of mercury. Concentrations of mercury in ICI's 4 effluent streams ranged from 0.0029 to 0.0073 mg/L, which exceeds the Ontario Industrial Effluent Objective (0.001 mg/L). Suspended solids ranged from 2.0 to 160 mg/L and oil and grease from <1 to 57 mg/L. The Ontario Industrial Effluent Objectives for suspended solids (15 mg/L) and oil and grease (15 mg/L) were both exceeded in these samples.

Organic parameters which were found at low, but detectable, concentrations include tetra- and pentachlorodibenzofurans and the bis(2-ethylhexyl)phthalate (Appendix IX, Stage 1 Report).

Environment Ontario industrial monitoring results for ICI Forest Products during 1990 are shown in Table 18. These results, when compared to 1988 data (Table 7-1), show that final effluent loadings for all conventional parameters decreased from 1988 to 1990, but mercury loadings increased slightly from 0.043 kg/day in 1988 to 0.0592 kg/day in 1990. The Ontario Industrial Effluent Objective of 0.001 mg/L for mercury is exceeded in all effluent samples from ICI Forest Products (Table 18). Total suspended solids ranged from 27.8 to 87.6 mg/L in 1990 and, although concentrations and loadings have decreased since 1988, values still exceed the Ontario Industrial Effluent Objective of 15 mg/L.

Cornwall Chemicals Ltd.

At Cornwall Chemicals, a number of industrial chemicals, such as sodium hydrosulphide, hydrochloric acid, carbon tetrachloride and carbon disulphide, are manufactured from the chlorine and sodium hydroxide produced at ICI Forest Products (formerly CIL). The effluent produced by these processes is clarified before discharge. Typical characteristics of this effluent are shown in Table 7-1.

Because of its source, the effluent contains significant quantities of carbon tetrachloride and measurable amounts of chloroform. Effluent concentrations of these two compounds are shown in the results of the 1987 MISA pre-regulation monitoring data (Appendix X, Stage 1 Report). Both compounds are considered problems in the environment because of their suspected carcinogenicity. The data in Appendix X (Stage 1 Report) also indicate that effluent concentrations of 25 other halogenated volatiles exceed concentrations in intake water (see column labelled 'well-city') by up to 10 times. These parameters include methylene chloride, trichloroethylene and vinyl chloride.

Other organic compounds that are elevated above intake concentrations include: toluene, xylenes, acrolein, acrylonitrile, carbon disulphide, octachlorodibenzo-p-dioxin, octachlorodibenzofuran, fluoranthene, benzyl butyl phthalate and di-n-octyl phthalate.

Concentrations of mercury (0.002 to 0.0037 mg/L) and zinc (0.14 to 2.93 mg/L) measured in Cornwall Chemicals' effluent in 1987 exceeded the Ontario Industrial Effluent Objectives of 0.001 and 1.0 mg/L, respectively (Appendix X, Stage 1 Report).

Cornwall Chemicals has carried out considerable in-plant process control work to locate sources of contaminants in order to recover more of the product prior to entering the waste stream.

A comparison of the 1987 MISA pre-regulation monitoring data (Appendix X, Stage 1 Report) and the MISA twelve month monitoring data, October 1989 through September 1990 (Table 19) reveals that concentrations of

Table 18. Effluent concentrations and loadings for conventional pollutants at ICI Forest Products and Stanchem in 1990 (Environment Ontario Industrial Discharge Monitoring, Environment Ontario Data Files, Cornwall Office).

Facility and Parameter	Concentration Range (mg/L)	Annual Average Concentration (mg/L)	Annual Average Loading (kg/day)
ICI Forest Products-Process Effluent			
Flow	90.2-314.5 m^3/day	218.7 m^3/day	-
COD	77.0-1200.0	593.0	153.5
TSS	244.9-1182.8	632.1	157.7
Mercury	0.0504-0.1866	0.0976	0.0189
Total Phosphorus	0.22-3.0	0.77	0.177
ICI Forest Products-Final Effluent			
Flow	2321.9-5894.7 m^3/day	3983.4 m^3/day	-
COD	13.0-200.0	64.75	239.07
TSS	27.8-87.6	54.1	213.137
Mercury	0.00587-0.03122	0.0138	0.0592
Total Phosphorus	0.114-0.29	0.196	0.801
Stanchem-Process Effluent			
Flow	24.5-39.6 m^3/day	28.8 m^3/day	-
COD	10.0-140.0	75.0	1.371
TSS	41.82-116.56	66.89	1.825
Mercury	0.000848-0.00868	0.00269	0.00011
Total Phosphorus	0.055-30.202	6.99	0.263
pH	6.11-7.62	7.16	-

most parameters have remained the same with a few exceptions. Although carbon tetrachloride concentrations have remained the same, chloroform concentrations have been reduced from an average of 0.6175 mg/L in 1987 to 0.0894 mg/L in 1990. Other noticeable reductions include tetrachlorethylene and specific conductance. Average tetrachlorethylene values decreased from 0.02382 mg/L in 1987 to 0.0014 mg/L in 1990. Specific conductance values were decreased by nearly one-third from 2400 μS/cm in 1987 to 1744 μS/cm in 1990. Mercury was the only parameter that showed an increase in average concentration (from 0.0024 mg/L in 1987 to 0.00306 mg/L in 1990). In both years average concentrations of mercury exceeded the Ontario Industrial Effluent Guideline of 0.001 mg/L.

The MISA twelve month monitoring program showed that final effluent from Cornwall Chemicals contained dioxins and furans (Tuszynski 1992). Toxicity Equivalence to 2,3,7,8-T4CDD (TEQ) was 1.5 pg/L with an annual loading of 0.07 grams/year.

Table 19. Twelve month average concentration (mg/L) and loading (kg/day) values for parameters found in process effluent from Cornwall Chemicals Ltd. Samples were collected between October 1, 1989 and September 30, 1990 for the MISA monitoring program (Tuszynski 1992).

Parameter	Twelve Month Average Concentration in Effluent Stream[1] (mg/L)	Twelve Month Average Loading (kg/day)
Flow	655 m^3/day	
DOC*	5.9	3.885
TOC*	7	4.744
COD*	98	58.465
Ammonia plus Ammonium*	0.31	0.168
Nitrate + Nitrite*	0.19	0.096
Total Kjeldahl Nitrogen*	1.0	0.534
Total Suspended Solids*	19	11.947
Volatile Suspended Solids*	11	5.758
Total Phosphorus*	0.17	0.106
Hydrogen Ion (pH)*	6.5	-
Specific Conductance*	1744 μS/cm	-
Oil and Grease*	4.7	3.196
Aluminum	0.3818	0.225
Beryllium	0.0033	0.002
Boron	0.1059	0.070
Cadmium	0.0009	0.001
Copper	0.0168	0.010
Molybdenum	0.0188	0.012
Nickel	0.1661	0.088
Thallium	0.0134	0.008
Vanadium	0.0178	0.010
Zinc	0.1178	0.080
Chromium (hexavalent)	0.005	0.003
Mercury	0.00306	0.002
Phenolics (4AAP)	0.001	**
Sulphide	5.3041	3.564

Table 19 (Cont'd)

Parameter	Twelve Month Average Concentration in Effluent Stream[1] (mg/L)	Twelve Month Average Loading (kg/day)
Bromodichloromethane	0.0026	0.002
Carbon tetrachloride	16.8774	11.361
Chloroform	0.0894	0.056
Chloromethane	0.0738	0.046
Methylene chloride	0.0059	0.004
Tetrachloroethylene	0.0012	0.001
Trichloroethylene	0.0022	0.001
1,2,3-Trichlorobenzene	11.2 ng/L	**
Hexachlorobenzene	41.6 ng/L	**
Hexachlorobutadiene	44.1 ng/L	**
Hexachlorocyclopentadiene	12.6 ng/L	**
Hexachloroethane	542.4 ng/L	**
Total H7CDD	0.053 ng/L	**
Total H7CDF	0.031 ng/L	**
Total O8CDD	0.090 ng/L	**

1 Sample Location: Manhole 26 Effluent to River
* Conventional Parameter
** Loading less than 1 gram/day

Stanchem

Stanchem operates a packaging plant that produces small quantities of chemicals in bottles, carboys or cylinders for laboratory and industrial use. The small amount of effluent produced is neutralized before being combined with Cornwall Chemicals' effluent.

Results of the MISA pre-regulation monitoring analyses of Stanchem's effluent are provided in Appendix XI (Stage 1 Report). Effluent exceeded the Ontario Industrial Effluent Objectives in at least one waste stream for pH (11.91), suspended solids (69 to 320 mg/L), cadmium (0.017 to 0.029 mg/L), copper (2.0 mg/L), lead (1.2 to 2.2 mg/L), mercury (0.003 to 0.0054 mg/L) and oil and grease (31 mg/L). Objectives for these parameters are: pH, 5.5 to 9.5; suspended solids, 15 mg/L; cadmium, 0.001 mg/L; copper, 1.0 mg/L; lead, 1.0 mg/L; mercury, 0.001 mg/L; and oil and grease, 15 mg/L.

The data in Appendix XI (Stage 1 Report) also indicate that the effluent from Stanchem contains several organic contaminants including two PAHs (bis(2-ethylhexyl)phthalate and di-n-butylphthalate), bromodichloromethane, chloroform, chloromethane, dibromochloromethane, tetrachloroethene, hexachloroethane, hexachlorobenzene and PCBs. The source of many of these compounds is believed to be contaminated containers which are returned to Stanchem. The waste stream likely becomes contaminated as a result of washing out the containers prior to refilling.

Table 18 shows conventional pollutants monitored at Stanchem during 1990. Levels of total suspended solids, mercury, COD and pH were lower in 1990 than in 1987, but levels of total suspended solids and mercury still exceeded the Ontario Industrial Effluent Objectives. Average total phosphorus concentration increased from 0.468 mg/L in 1987 to 6.99 mg/L in 1990.

8.6 Addendum to Section 7.1.3, Courtaulds Fibres (closed 1992) and Courtaulds Films (closed 1989)

Courtaulds Fibres (closed 1992) produced rayon, a man-made fibre with properties similar to cotton, by treating wood pulp with sodium hydroxide and carbon disulphide to form an intermediate product -- viscose containing zinc and sodium sulphate. The viscose was injected into a sulphuric acid bath to form rayon fibres, which are used in the manufacture of clothing and fabrics. Courtaulds Fibres closed its Cornwall plant in November 1992.

Courtaulds Films (closed 1989) (formerly BCL Canada Ltd.) bought viscose from Courtaulds Fibres (closed 1992) and injected it into a sulphuric acid bath through a long narrow slit to produce cellophane. Cellophane is used for packaging goods or making adhesive tape. Courtaulds Films ceased operations in September 1989.

The acid, sulphide and storm sewers were process sewers which originally serviced both companies. An additional process sewer, the alkaline or viscose sewer, discharged wastes generated at Courtaulds Fibres (closed 1992). Effluent in these sewers was untreated. An additional three sewers discharged cooling or condensate water generated in the Courtaulds Fibres Acid Recovery Plant: the acid recovery sewer, the Caravelle Carpets sewer and the tank car unloading sewer.

The alkaline (viscose) sewer had a pH of 10-12, and relatively high BOD and total suspended solids. No facility existed to neutralize effluents with a high pH. At the river bank, the sulphide and alkaline sewers combined and discharged through a diffuser located in the river, 244 m from shore.

The acid sewer was characterized by low pH, low BOD, and high concentrations of zinc, suspended solids and sulphuric acid. Courtaulds Fibres was the primary source of zinc from Cornwall area sources. The acid sewer discharged to the St. Lawrence River through the acid diffuser, which is also about 244 m offshore. The total amount of effluent discharged by the Courtaulds Fibres/Courtaulds Films (closed 1992/1989) complex was approximately 10,000 m^3/day. Table 7-1 lists concentrations and loadings of conventional pollutants in these sewers in 1988.

Effluent from all of the process sewers was extremely toxic to rainbow trout. Environment Ontario has an extensive data bank for all Courtaulds' sewers. A solution of only 2-12% effluent killed 50 percent of test fish within 96 hours (Environment Ontario 1991).

Appendix XII (Stage 1 Report) contains a summary of the results of the 1987 MISA pre-regulation monitoring program. The Ontario Industrial Effluent Objectives were exceeded in at least one effluent stream for pH, suspended solids, mercury and zinc, and concentrations of zinc were up to 60 times greater than the Objective of 1.0 mg/L. The recommended pH range of 5.5-9.5 was violated at both extremes, with pH in the alkaline sewer as high as 11.5 and in the acid sewer as low as 1.8.

A comparison of the 1987 MISA pre-regulation monitoring data (Appendix XII, Stage 1 Report) and the MISA twelve month monitoring data (October 1, 1989 through September 30, 1990) (Table 20) shows that from 1987 to 1990, average levels of mercury increased in the acid and alkaline (viscose) sewers, total suspended solids increased in all sewers and zinc increased in all sewers except the storm sewer. Effluent in two or more sewers continued to violate Ontario Industrial Effluent Objectives for these parameters; increases occurred mostly in the acid and alkaline (viscose) sewers.

According to 1990 MISA results, pH in both the acid and alkaline sewers continued to violate the Ontario Industrial Effluent Objective. The acid sewer had a twelve month mean pH of 2.1, violating the Objective of 5.5. The alkaline sewer had a twelve month mean pH of 11.1, violating the Objective of 9.5.

From October 1, 1989 to September 30, 1990, Courtaulds Fibres (closed 1992) discharged more mercury than any other industry in the MISA-monitored Organic Chemical Manufacturing Sector (Tuszynski 1992), with an average mercury loading of 0.074 kg/day from Courtaulds during this period. Ethyl Corporation (St. Clair River AOC) discharged the second greatest amount of mercury, with a loading of 0.020 kg/day. In Courtaulds Fibres' acid sewer, average annual mercury concentrations increased from 0.00238 mg/L in 1987 to 0.01026 mg/L in 1990. The 1990 value exceeds the Industrial Effluent Objective of 0.001 mg/L by an order of magnitude. Average mercury concentrations in the alkaline sewer increased from 0.0021 mg/L in 1987 to 0.00473 mg/L in 1990, exceeding the Industrial Effluent Objective in both years. According to Environment Ontario auditing samples taken in 1991 and 1992 (Table 21), mercury concentrations in all sewers had decreased from those recorded by the 1990 MISA monitoring program.

Total suspended solids (TSS) increased more than any other parameter over the period from 1987 to 1990. Average TSS concentration in the alkaline (viscose) sewer increased from 35.5 mg/L in 1987 to 111 mg/L in 1990, greatly exceeding the Industrial Effluent Objective of 15 mg/L in both years. Average TSS concentrations in the acid sewer showed a similar trend, increasing from 56.73 mg/L in 1987 to 91 mg/L in 1990. Although in all other sewers, except the storm sewer, average concentrations more than doubled, they did not exceed the Objective.

During the twelve month (October 1, 1989 to September 30, 1990) MISA monitoring period, Courtaulds Fibres (closed 1992) was the greatest discharger of zinc, by an order of magnitude, in the entire Organic Chemical Manufacturing Sector (Tuszynski 1992). Loadings of zinc averaged 345 kg/day from Courtaulds Fibres during this period. Dow Chemical (St. Clair River AOC) was the second greatest discharger of zinc, with a loading of 92 kg zinc/day (Tuszynski 1992). Average 1990 zinc concentrations in Courtaulds Fibres' effluent exceeded the Industrial Effluent Objective of 1.0 mg/L in all sewers except the storm sewer, whereas in 1987 the Objective was exceeded only in the acid and storm sewers. In both years, the highest concentration of zinc was found in the acid sewer, increasing from 48.1 mg/L in 1987 to 52.3849 mg/L in 1990.

Effluent from all sewers was tested for dioxins and furans during the MISA twelve month monitoring survey. Dioxins and furans were not found in any of the six Courtaulds effluent streams (Tuszynski 1992).

On November 30, 1992, Courtaulds Fibres closed its Cornwall operation.

Table 20. Twelve month average concentration (mg/L) and loading (kg/day) of parameters in process effluent from Courtaulds Fibres Canada. Samples were collected between October 1, 1989 and September 30, 1990 for the MISA monitoring program (Tuszynski 1992; Environment Ontario 1990c).

Parameter	Acid Sewer		Alkaline (Viscose) Sewer		Storm Sewer		Acid Recovery Sewer		CS2 (tank car unloading) Sewer		Caravelle Sewer		Total Loading (kg/day)
	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	
Flow	5,426 m^3/day		1,524 m^3/day		10,077 m^3/day		31,604 m^3/day		6,447 m^3/day		11,167 m^3/day		
DOC*	210.0	1066.466	80.2	124.576	6.5	58.955	4.9	153.143	5.0	33.229	5.1	57.521	1493.890
TOC*	211	1063.755	98	155.111	6	50.426	4	120.620	4	26.580	4	41.438	1457.930
COD*	537	3405.330	810	1417.503	28	241.493	16	595.836	17	104.605	131	1184.212	6948.979
Ammonia plus Ammonium*	0.25	1.678	0.16	0.210	0.05	0.288	0.15	4.691	0.11	0.876	0.10	0.868	8.611
Nitrate + Nitrite*	0.48	2.484	0.37	0.586	0.80	5.775	0.63	21.009	0.41	2.439	0.32	3.240	35.533
Total Kjeldahl Nitrogen*	0.6	3.219	1.2	0.988	0.4	2.228	0.2	8.421	0.2	1.493	0.3	2.530	18.879
Total Suspended Solids*	91	497.948	111	172.095	13	137.350	9	261.414	7	46.346	7	76.809	1191.962
Volatile Suspended Solids*	73	393.743	56	74.958	8	71.534	7	200.989	6	41.462	6	63.469	846.155
Total Phosphorus*	0.14	0.811	0.12	0.206	0.12	1.046	0.08	2.423	0.10	0.601	0.108	0.902	5.989
Hydrogen Ion (pH)*	2.1	-	11.1	-	7.7	-	6.9	-	6.6	-	6.7	-	-
Specific Conductance*	8299 µS/cm	-	3388 µS/cm	-	366 µS/cm	-	411 µS/cm	-	386 µS/cm	-	433 µS/cm	-	-
Oil and Grease*	100.7	517.943	62.1	87.482	1.9	19.559	1.7	53.911	1.8	12.044	3.6	36.326	727.265
Cyanide Total	0.004	0.030	0.007	0.019	0.001	0.008	0.001	0.044	0.001	0.007	0.001	0.013	0.121
Aluminum	0.3943	1.970	0.2057	0.295	0.1787	1.579	0.0897	2.906	0.1105	0.679	0.0968	0.987	8.416
Boron	0.0504	0.230	0.0410	0.065	0.0288	0.276	0.0272	0.887	0.0263	0.159	0.0320	0.331	1.948
Cadmium	0.0032	0.015	0.0015	0.002	0.0013	0.012	0.0013	0.040	0.0013	0.008	0.0013	0.013	0.090
Chromium	0.1155	0.612	0.0494	0.055	0.0167	0.160	0.0059	0.181	0.0049	0.029	0.0085	0.087	1.124
Copper	0.0612	0.307	0.0262	0.039	0.0323	0.156	0.0241	0.772	0.0086	0.055	0.0070	0.074	1.403
Lead	0.2380	1.257	0.0919	0.155	0.0118	0.113	0.0120	0.394	0.0120	0.073	0.0135	0.147	2.139
Nickel	0.0328	0.156	0.0146	0.022	0.0074	0.079	0.0072	0.241	0.0063	0.038	0.0080	0.088	0.624
Zinc	52.3849	273.601	2.4599	2.932	0.5604	5.074	1.2426	37.717	1.4896	10.144	1.4105	15.923	345.391
Antimony	0.0073	0.038	0.0018	0.006	0.002	0.024	0.0014	0.055	0.002	0.014	0.002	0.021	0.158
Chromium (hexavalent)	0.047	0.255	-	-	0.018	0.178	-	-	0.020	0.119	0.020	0.226	0.778
Mercury	0.01026	0.056	0.00473	0.007	0.00027	0.002	0.00018	0.006	0.00018	0.001	0.00014	0.002	0.074

Table 20 (Cont'd)

Parameter	Acid Sewer		Alkaline (Viscose) Sewer		Storm Sewer		Acid Recovery Sewer		CS2 (tank car unloading) Sewer		Caravelle Sewer		Total Loading (kg/day)
	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	Conc. (mg/L)	Loading (kg/d)	
Phenolics (4AAP)	0.0174	0.092	0.0186	0.044	0.0025	0.027	0.0037	0.139	0.0031	0.021	0.0036	0.037	0.360
Sulphide	29.6564	161.415	94.1721	147.138	4.0297	41.909	1.0973	34.238	1.6283	10.678	1.3087	14.614	409.992
1,2-Dichloroethane	0.0011	0.005	0.0011	0.001	0.0011	0.009	0.0011	0.033	0.0014	0.009	0.0011	0.012	0.069
Chloroform	0.0319	0.169	0.0156	0.022	0.0016	0.013	0.0012	0.038	0.0013	0.008	0.0013	0.015	0.265
Methylene chloride	0.0011	0.005	0.0038	0.007	0.0019	0.014	0.0017	0.053	0.0020	0.013	0.0023	0.023	0.115
Toluene	0.0011	0.004	0.0012	0.001	0.0008	0.007	0.0027	0.089	0.0060	0.038	0.0049	0.052	0.191
Diphenyl ether	0.0005	0.003	0.0005	0.001	0.0003	0.003	0.0003	0.010	0.0003	0.002	0.0003	0.003	0.022
Phenol	0.0021	0.010	0.0016	0.002	0.0008	0.008	0.0007	0.027	0.0007	0.005	0.0007	0.007	0.059
Biphenyl	0.0004	0.003	0.0004	0.001	0.0004	0.006	0.0004	0.015	0.0004	0.003	0.0004	0.004	0.032
Bis(2-ethylhexyl)phthalate^	0.0047	0.028	0.0046	0.017	0.0014	0.020	0.0014	0.054	0.0014	0.010	0.0014	0.015	0.144
Di-n-octylphthalate^	0.0008	0.005	0.0037	0.259	0.0009	0.013	0.001	0.040	0.0008	0.006	0.0008	0.008	0.331
1,2,3-Trichlorobenzene^	8.6 ng/L	**	8.6 ng/L	**	8.6 ng/L	**	8.6 ng/L	**	8.6 ng/L	**	11.3 ng/L	**	**
2,4,5-Trichlorotoluene^	2.7 ng/L	**	2.7 ng/L	**	3.4 ng/L	**	2.7 ng/L	**	2.7 ng/L	**	8.9 ng/L	**	**
Hexachlorobenzene^	3.5 ng/L	**	3.0 ng/L	**	3.0 ng/L	**	3.0 ng/L	**	3.0 ng/L	**	10.2 ng/L	**	**
Hexachloroethane^	1.7 ng/L	**	1.7 ng/L	**	1.17 ng/L	**	1.7 ng/L	**	1.7 ng/L	**	2.2 ng/L	**	**
Pentachlorobenzene^	2.1 ng/L	**	2.1 ng/L	**	2.1 ng/L	**	2.1 ng/L	**	2.1 ng/L	**	9.2 ng/L	**	**

* Conventional parameter
** Loading less than 1 gram/day
\- Not required by regulation or no concentration/flow data available
^ Six months monitoring data, October 1, 1989 through March 31, 1990 (Environment Ontario 1990c).

Table 21. Mercury concentration (mg/L) in effluent from Courtaulds Fibres. Results are from Environment Ontario audit samples (Environment Ontario Data Files, Cornwall Office).

Sample Date	Acid Sewer (mg/L)	Alkaline Sewer (mg/L)	Storm Sewer (mg/L)	Acid Recovery Sewer (mg/L)	CS2 (tank car unloading) sewer (mg/L)	Caravelle Sewer (mg/L)
Nov. 2, 1989*	0.00184	0.00331	-	0.00005 <T	0.00003 <T	0.00002 <T
Sept. 25, 1990*	0.00272	0.00359	0.00025	0.00005 <T	0.00005 <T	0.00005 <T
Oct. 22, 1991	0.00180	0.00330	<0.00003	<0.00006	<0.00005	<0.00002
Jan. 28, 1992	0.00047	<0.00002	<0.00003	<0.00002	<0.00002	<0.00002
MISA Annual Average (Oct.1, 1989 to Sept. 30, 1990)	0.01026	0.00473	0.00027	0.00018	0.00018	0.00014

* The first two audit samples were taken during the MISA monitoring period.

<T Mercury concentration has been tentatively identified. This concentration is normally slightly above the detection limit.

8.7 Addendum to Section 7.1.4, Cornwall Water Pollution Control Plant

In 1987, the City of Cornwall conducted an inventory of approximately 60 industries that discharge effluent to the Cornwall WPCP. The two main industries discharging to the municipal sewer system were BASF and Champlain Industries. Characteristics of their 1991 discharges to the Cornwall WPCP are shown in Table 22.

Conventional parameters are measured weekly in wastewater entering the Cornwall WPCP. The 1991 weekly monitoring results for influent and effluent of the Cornwall WPCP are shown in Table 23. Annual average loadings of BOD_5 decreased by more than one-half from 1988 (2,228.5 kg/d) to 1991 (958.4 kg/d) (Tables 7-1 and 23). Annual average loadings of suspended solids and total phosphorus also decreased during the same period.

Table 22. Concentration (mg/L) of conventional parameters in effluent from industries discharging to the City of Cornwall sanitary sewer system during 1991 (Environment Ontario Data Files, Cornwall).

Facility and Parameter	Concentration Range (mg/L)	1991 Annual Average Concentration (mg/L)
BASF		
pH	6.84-8.21	7.79
BOD_5	1-54	10
Suspended Solids	1-486	89
Total Phosphorus	0.37-5.84	2.39
Champlain Industries		
pH	3.94-8.28	7.63
BOD_5	9-2759	529
Suspended Solids	127-1890	593
Total Phosphorus	3.4-45.6	22.5

Table 23. Annual average concentration (mg/L) and loading (kg/day) of conventional parameters regularly monitored in untreated (influent) and treated (effluent) wastewater at the Cornwall WPCP, 1991 (Environment Ontario Data Files, Cornwall Office). Range of monthly means in parentheses.
Mean monthly effluent flow = 45,637 m^3/day (Range: 36,404 - 67,131 m^3/day)

Parameter	Mean Influent Concentration (mg/L)	Mean Effluent Concentration (mg/L)	Mean Annual Loading (kg/day)
BOD_5	54 (36-79)	21 (16-26)	958.4
Suspended Solids	112 (66-158)	22 (17-26)	1004
Total Phosphorus	2.69 (1.9-3.3)	0.77 (0.55-0.89)	35.14

8.8 Addendum to Section 7.1.5.1, Toxicity of Cornwall Industrial Discharges to Rainbow Trout and *Daphnia magna*

Courtaulds Fibres (closed 1992) and Courtaulds Films (closed 1989)

Thirty-eight trout bioassays and *Daphnia magna* acute lethality toxicity tests were conducted on effluent from Courtaulds Fibres between October 1989 and March 1990 (Lee *et al.* 1991). In the trout bioassays, all samples of process effluent collected from two sites, the acid sewer and the alkaline sewer, were acutely lethal to test fish. The six samples collected from the acid sewer had 96-hour LC50s of 6.3%, 3.0%, 3.9%, 12.0%, 1.0% and 2.0% effluent; samples collected from the alkaline sewer had 96-hour LC50s of 61.0%, 8.8%, 12.0%, 14.1%, 18.4% and 12.6%. All samples, except one, collected from the four combined effluent discharges were non-acutely lethal to test fish. The exception was an Environment Ontario audit sample, collected in November 1989 from one of the combined effluent sewers, which had a 96 hour LC50 of 53.0%. Both intake water samples were non-acutely lethal.

In bioassays using *Daphnia magna*, samples from various outfall points were either very toxic or had low levels of acute toxicity (Lee *et al.* 1991). One sample of intake water collected in December 1989 was non-lethal, and one sample of stormwater collected in October 1989 had an LC50 of 8.8%. Sixteen of seventeen samples from combined effluents were either not acutely lethal to *Daphnia magna* (29% of samples) or fewer than 4 test animals died during any one test. One sample from combined effluent station #600 (acid recovery sewer to river), collected in January 1990, was acutely lethal to *Daphnia magna*, with an LC50 of 60.9%.

Samples from process effluents in the acid sewer and the alkaline sewer were consistently acutely toxic. All twelve samples from these outfalls had LC50 < 8% effluent, and ll of 12 samples had LC50 < 4%. Much of the toxicity at these outfalls was attributed to extremes in effluent pH. The acid sewer effluent consistently had a pH of 2, and the alkaline sewer effluent consistently had pH > 11.5. At these pHs, *Daphnia magna* die within the first hour of exposure to 100% effluent concentrations. MOE audit samples were tested in the Ministry laboratory in November 1989, with results consistent with those submitted by Courtaulds Fibres (Lee *et al.* 1991).

Domtar Inc.

Domtar Inc. provided data from six tests of *Daphnia magna* acute lethality of samples of total mill effluent collected between January and June 1990. Two samples had LC50 > 100% effluent and two were nonlethal. Two samples were lethal to *D. magna*, with LC50s of 39.0% and 26.7% effluent. An Environment Ontario audit sample tested in March 1990 was also lethal, with an LC50 of 75.6% (Environment Ontario 1992a). Six tests on samples collected between July and December 1990 showed lower toxicity. Two samples had an LC50 > 100% effluent and four were nonlethal (Environment Ontario 1992b).

Domtar Inc. conducted one test of rainbow trout acute lethality on total mill effluent collected between January and June 1990. The sample was lethal, with an LC50 of 65.7% effluent. An Environment Ontario sample taken in March 1990 had LC50 >100% effluent (Environment Ontario 1992b). Another six tests were done between July and December 1990. Two samples were lethal with LC50s of 66.1% and 57.0% effluent, two samples had an LC50 >100% effluent, and two were nonlethal (Environment Ontario 1992b).

8.9 Addendum to Section 7.1.6, Spills

On August 4, 1989, Reynolds Metals Company, located near Massena, NY, spilled 3,406.51 L (900 US Gallons) of liquid fluoride. Heavy rain caused the fluoride tank to overflow and enter the St. Lawrence River. It was not possible to clean up the spill since fluoride is water-soluble (Environment Ontario Data Files, Cornwall Office).

Appendix I provides details of spills that occurred in Cornwall from 1990 to 1992.

8.10 Addendum to Section 7.2.2, Waste Disposal Sites

Locations of active and closed waste disposal sites within the St. Lawrence River AOC are shown in Figure 4.

City of Cornwall Sanitary Landfill Sites

Surface water monitoring at the City of Cornwall Sanitary Landfill sites (both closed and active) indicated that surface water quality was affected by toe seepage from the old landfill site (City of Cornwall 1991). Results of monitoring from 1986 through 1991 are shown in Table 24. In particular, surface water discharging from the closed landfill site (sample location SW3) was affected. Chloride concentrations and conductivity appeared to have increased markedly in surface water discharged from the closed landfill site (sample location SW3) and values of all measured parameters were higher than in background surface water samples (SW1 and SW5).

To overcome this problem, a toe drain and leachate collection system were installed around the perimeter of the old landfill during the summer of 1991 in order to intercept the toe seepage. Monitoring results are not yet available.

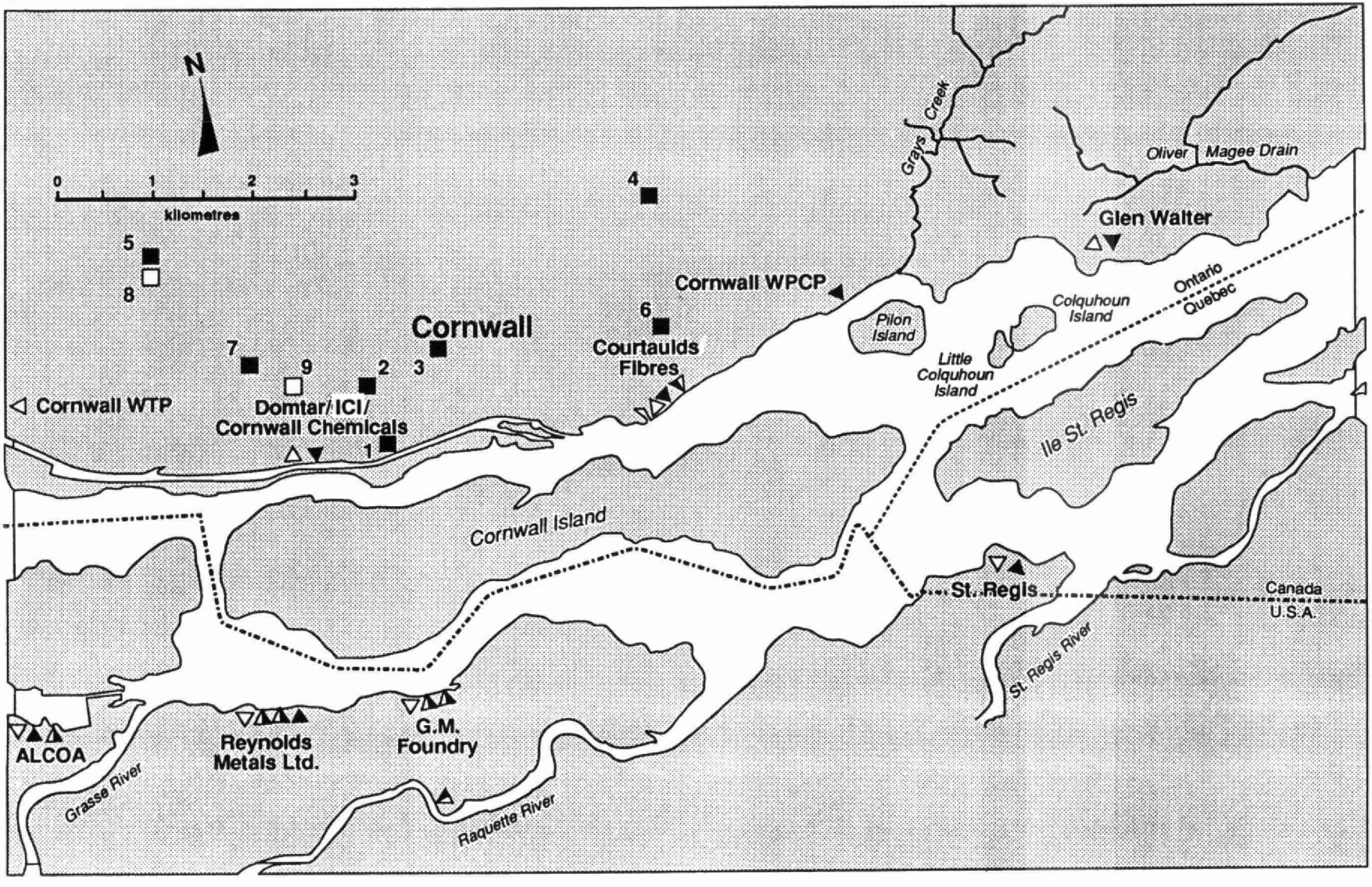
Leachate from the active landfill site enters the municipal sewer system for treatment at the Cornwall WPCP. Two to six leachate samples per annum, from 1986 to 1991, were collected from Manhole No. 2, immediately north of Vincent Massey Drive. Annual average concentrations are summarized in Table 25. During this six year period, concentrations of conventional parameters (conductivity, COD, BOD, chlorine, alkalinity and total suspended solids) steadily increased. Metal concentrations fluctuated somewhat but remained the same overall, but mercury steadily decreased from 0.1 mg/L in 1986 to <0.001 mg/L in 1991. Interpretation of PCB concentration data over this time period is difficult since the results indicate an increase in detection limit (*i.e.*, PCB concentration was recorded as <20 ng/L from 1986 to 1989 and <3000 ng/L in 1991).

figure 4

St. Lawrence Remedial Action Plan - Cornwall / Lake St. Francis area

Location of active and closed waste disposal sites in the St. Lawrence River Area of Concern

(Anderson 1990)



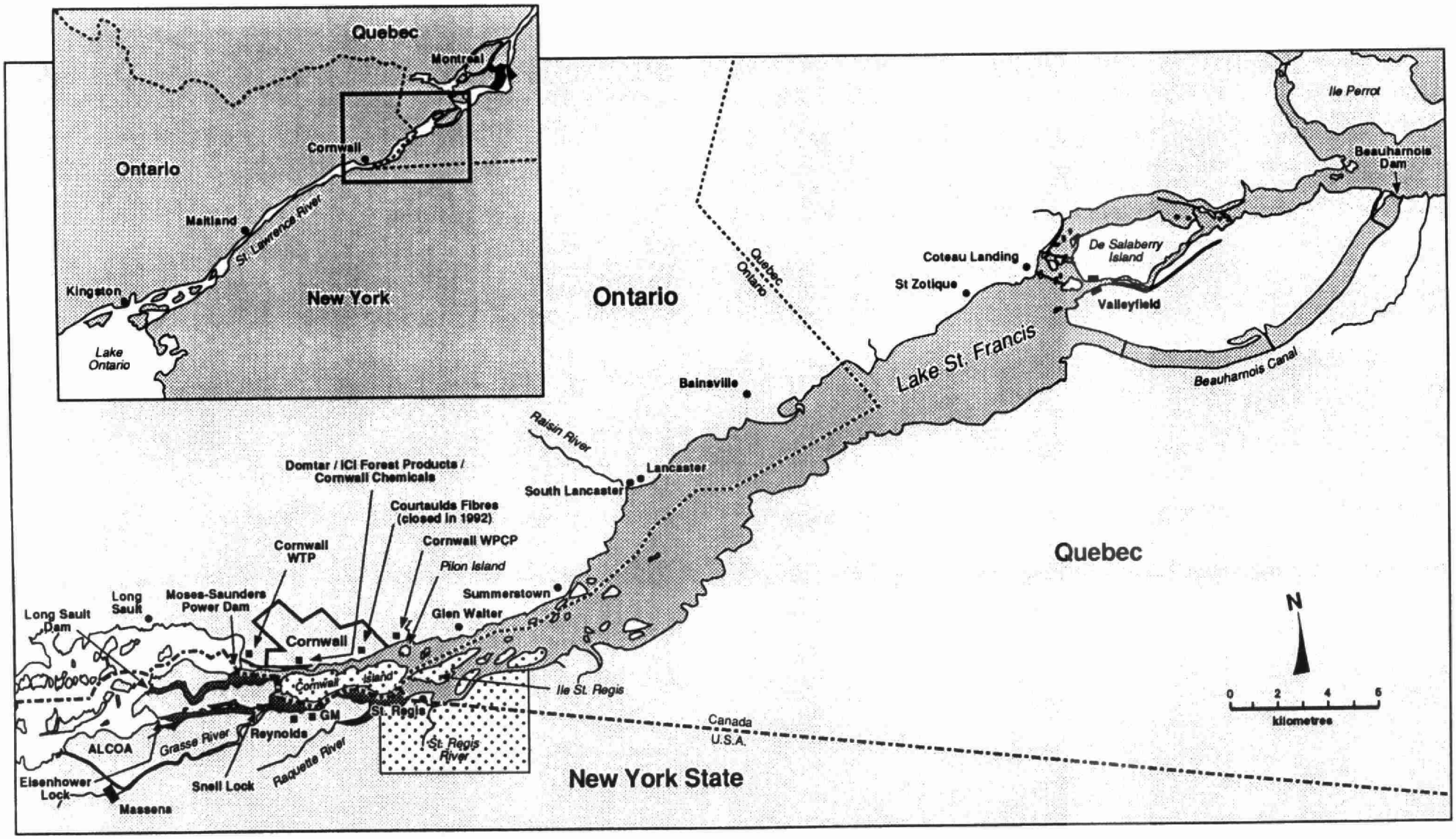
△ Intake
▲ Outfall (in pipe)
◮ Outfall (in river at shore)

■ Closed Waste Disposal Sites
- Municipal: **1, 2, 3, 4, 5**
- Courtaulds: **6**
- Pfizer: **7**

□ Open Waste Disposal Sites
- Municipal: **8**
- Domtar: **9**

figure 5

St. Lawrence River RAP Area of Concern



Canadian area of concern

U.S. area of concern

Akwesasne lands

Intake and/or outfall

Table 24. Surface water quality (1987 to 1991) at the City of Cornwall active and closed landfill sites (City of Cornwall 1991). Results expressed as annual average concentration (mg/L). Blanks indicate data unavailable.

Station locations:

SW1 - Background (west of old landfill site)
SW2 - Downstream of runoff confluence from new site and south side of old site
SW3 - Further downstream of confluence of flow from SW1 and SW4
SW4 - Offsite surface water drainage from old landfill site
SW5 - Northeast of old landfill in a tributary to the Henderson drain

Year & Parameter	Station				
	SW1	SW2	SW3	SW4	SW5
1987					
pH	7.12				
Conductivity (μmhos/cm)					
Alkalinity as $CaCO_3$	559				
Hardness as $CaCO_3$	248				
BOD	5.15				
COD	21.12				
Chlorides	84.4				
Nitrate as N					
Nitrite as N					
Ammonia as N					
Total Nitrogen					
Sulphate					
Total Phosphorus					
1989					
pH	7.40	7.84	7.33	7.4	
Conductivity (μmhos/cm)	613.5	2170	1099.5	1034.5	
Alkalinity as $CaCO_3$	230	557	335	304	
Hardness as $CaCO_3$	216.2	262.25	360.2	332.2	
BOD	12.65	9	8.65	2.75	
COD	17	72	39	32.5	
Chlorides	86.75	439.5	130.45	136.5	
Nitrate as N					
Nitrite as N					

Table 24 (Cont'd)

Year & Parameter	Station				
	SW1	SW2	SW3	SW4	SW5
Ammonia as N					
Total Nitrogen					
Sulphate					
Total Phosphorus					
1990					
pH	7.35	8.02	7.71	7.69	7.99
Conductivity (μmhos/cm)	616.3	3330	969	1263	486.67
Alkalinity as $CaCO_3$	221.3	917	291	382.67	181.33
Hardness as $CaCO_3$	268.3	524	287	309.33	232.33
BOD	1.83	7.03	2.17	3.43	1.53
COD	21.93	100.37	32.23	38.37	17.2
Chlorides	66.5	589.7	87.5	297.9	27.23
Nitrate as N	0.43	2.54	0.63	0.7	0.24
Nitrite as N	<0.10	<0.10	<0.10	<0.10	<0.10
Ammonia as N	<0.10	1.11	<0.10	<0.10	<0.10
Total Nitrogen	0.5	1.21	0.72	1.4	0.21
Sulphate	12	171	13	15	40
Total Phosphorus	0.03	0.27	0.05	0.08	0.02
1991					
pH	6.92	8.11	7.49	7.70	7.78
Conductivity (μmhos/cm)	619	2230	872	1119	501
Alkalinity as $CaCO_3$	202	520	254	327	183
Hardness as $CaCO_3$	230	360	243	234	230
BOD	1.1	8.1	1.5	2.4	1.5
COD	14.1	57.0	29.1	34.6	7.5
Chlorides	47.1	261	88.3	100.2	15.8
Nitrate as N					
Nitrite as N					
Ammonia as N					

Table 24 (Cont'd)

Year & Parameter	Station				
	SW1	SW2	SW3	SW4	SW5
Total Nitrogen					
Sulphate					
Total Phosphorus	0.07	0.26	0.08	0.13	0.06

Domtar Waste Disposal Site

The Domtar Waste Disposal site, located at the north end of the Domtar property, is an approved site at which clarifier sludge and spent bark is deposited. Leachate is collected and discharged to the city's sewer system for treatment, and has been monitored monthly since April 1989. Results for suspended solids, dissolved solids and BOD_5 from 1989 through 1991 are given in Table 25. Loadings of dissolved solids ranged from 292.18 kg/day to 412.99 kg/day, whereas suspended solid loadings were lower, reaching a maximum in 1990 of 8.45 kg/day. BOD_5 loadings also reached a maximum in 1990, averaging 74.69 kg/day in that year.

Domtar leachate has not been analyzed for dioxins and furans.

Table 25. Domtar leachate quality, 1989 through 1991. Samples were collected monthly at the "Ski Hill Drain" (Industry Self-Monitoring Results, Environment Ontario Data Files, Cornwall Office).

Parameter	1989		1990		1991	
	Mean Annual Conc. (mg/L)	Mean Annual Loading (kg/day)	Mean Annual Conc. (mg/L)	Mean Annual Loading (kg/day)	Annual Ave. Conc. (mg/L)	Annual Ave. Loading (kg/day)
Flow	73.86 m^3/day		65 m^3/day		79.8 m^3/day	
Suspended Solids	29.25	2.16	130	8.45	35	2.79
Dissolved Solids	5591.5	412.99	4495	292.18	5055	403.39
pH at 25°C	7.4	-	7.3	-	7.7	-
BOD_5	88.25	6.52	1149	74.69	351	28.01

ICI Forest Products' Sodium Chloride Brine Mud Stockpiles

Sodium chloride brine purification mud was stored at ICI's Cornwall Works following the implementation, in 1986, of Ontario Regulation 309 which listed this material as a Schedule I Hazardous Industrial Waste. Beginning in 1984, prior to Regulation 309, ICI Forest Products (formerly CIL) pursued an application with the Ontario Ministry of the Environment (Environment Ontario) to have this material delisted as Hazardous Waste. Sodium chloride brine purification mud has been stockpiled on site since 1986, pending an Environment Ontario decision.

In May 1992, sodium chloride brine purification mud was delisted, with certain conditions attached, including a requirement to submit to Environment Ontario a plan for sampling and testing the stockpiled mud prior to removal. The brine mud must meet the following requirements:

- mercury concentration in mud must be <10 mg/kg dry weight;
- Regulation 309 leachate must contain <0.100 mg/L mercury; and
- brine mud must pass the Regulation 309 slump test.

Approximately 6500 tonnes of sodium chloride brine purification mud have been stockpiled at Cornwall Works since May 1986. The stockpiles are contained in two areas:

- Old CS_2 Water Containment Moat (Big Blue): Brine mud generated from May 1986 to early 1989 is stored in a steel moat which has been used to contain water around a CS_2 storage tank. This structure has a diameter of about 24 metres and the brine mud is at a depth of 3.8 metres.
- Lined pits north of Cornwall Chemicals and west of Conpak: There are three impoundments which were prepared by excavating to a depth of 2.4 metres with a ramp at one end. Some of the excavated earth was used to form berms for the impoundment. The impoundments were

lined with PE sheet and were filled by layers, therefore the deeper down in each impoundment, the older the mud.

Impoundment #1: ground level dimensions are 24 m x 9.5 m. It contains brine mud generated from early 1989 through March 1990.

Impoundment #2: ground level dimensions are 40 m x 11 m. It contains brine mud generated from April 1990 through May 1991.

Impoundment #3: ground level dimensions are 28 m x 10.5 m. It was started in June 1991 and is still being used.

Brine muds are sampled regularly before they are transported to the impoundment areas. Samples are composited and each monthly composite analyzed for mercury content and Regulation 309 leachate. This provides a permanent record of the nature of brine mud deposited at each impoundment.

Between November 1989 and August 1990, several samples contained more than 10 mg mercury/kg, although for most of these samples the Regulation 309 leachate test results were < 0.001 mg Hg/L. These samples were taken from brine mud located at the top of Impoundment #1 and the bottom of Impoundment #2. There are no other recorded periods of sustained elevated mercury concentrations (Environment Ontario Data Files, Cornwall Office).

ICI Forest products has completed a plan for sampling and disposing of approved brine mud in the City of Cornwall Sanitary Landfill. Brine mud which does not meet the specified requirements will be consolidated on site at ICI Forest Products for eventual removal as hazardous waste or possible treatment in order to reduce the mercury content. As of November 1992, approximately 400 tonnes of brine mud had been sampled and moved to the City of Cornwall Sanitary Landfill. The City takes samples of brine mud in the landfill twice a year.

Courtaulds Fibres Waste Disposal Site

Disposal site information and leachate analysis results are not available.

8.11 Addendum to Section 7.2.3, Atmospheric Emissions

In 1978, ICI Forest Products (formerly CIL) reported total mercury losses of 214.17 kg, of which 184.17 kg were lost to the air and 30.0 kg to the water. By 1983, total mercury emissions were reduced to 73.69 kg (54.59 kg to the air, 19.10 kg to the water) (McLaughlin and Palmer 1986).

Environment Ontario conducted an air moss/moss bag survey within and around the ICI chlor-alkali plant in 1983. Moss bags were placed within the mercury cell room and at regular distances from the cell room to a vegetable plot site. Mercury concentrations in the moss bags decreased exponentially with increasing distance from the cell room building (Table 26). The mean concentration of mercury in moss bags suspended over cell room vents for the duration of the experiment (*i.e.*, mean of two consecutive 30-day exposures) was 519 mg Hg/kg dry weight. Hg concentration in moss bags placed a distance of 10 m from the cell room wall ranged from 5.8 to 11.7 mg/kg dry weight; bags placed 40 m south of the cell room had Hg concentrations between 2.8 and 4.0 mg/kg dry weight. This suggests that most of the mercury emitted from the cell room is not deposited in the immediate vicinity but is dispersed over a large area related to wind patterns.

The mean ambient air mercury concentration, measured at the experimental garden site was 1.4 $\mu g/m^3$. The half hour Environment Ontario average ambient mercury criterion is 5 $\mu g/m^3$. The maximum half hour average observed during air monitoring was 2.9 $\mu g/m^3$. Ambient air mercury concentrations were lower at night, averaging 0.06 $\mu g/m^3$.

Table 26. Moss bag mercury concentrations (mg/kg dry weight) in the vicinity of the ICI cell room building and field experiment site in 1983 (McLaughlin and Palmer 1988).

Distance from Cell Room (m)	Mean* Hg level in Moss (mg/kg dry weight)	
	West Transect	East Transect
0 (cell room vent)	519	
10	5.8	11.7
20	3.5	6.2
30	3.2	5.8
40	2.8	4.0

* mean of 2 consecutive 30-day exposures, approximately 100 cm above ground

8.12 Addendum to Section 7.3, Historical Point Source Discharges

The following industries have now closed or, in the case of BASF, have drastically reduced production.

Marimac Inc. (formerly ITEA Canada Ltd.)

Marimac Inc. (formerly ITEA Canada Ltd.) wove polyester yarn into large sheets of material which were dyed, treated and shipped to affiliated plants. Liquid effluents were discharged into three holding tanks via a drainage collecting system under the Dye House and Heat Set sections of the factory. The effluent stream was composed of used dye bath solution, soap and ash soda solution from rinsing, and liquids associated with treatments applied during the Heat Set. Effluent overflowed each of the three holding tanks in turn before discharging to the St. Lawrence River. These holding tanks served only as dye separators; there was no other treatment associated with this process. On August 9, 1988 Marimac's plant drainage system was connected to the City of Cornwall sanitary sewer on Boundary Road. Marimac was closed in 1990.

Concentrations and loadings of Marimac effluent in 1985 and 1987 are shown in Table 27. Annual average flows and concentrations (and therefore loadings) decreased between 1985 and 1987.

There were no significant air emissions from Marimac. The only exhausted air was that associated with the Heat Set treatment.

Table 27. Historical discharges to the St. Lawrence River by industries that are now closed (Environment Ontario Data Files, Cornwall Office).
Note: Data for Courtaulds Fibres (closed in November 1992, after this report was written) is provided elsewhere in this report.

Industry and Parameter	Date Closed	Effluent Concentration Range (mg/L)	Average Concentration (mg/L)	Average Loading (kg/day)
Marimac Inc. (1985)	closed 1990			
Flow		2,500-4,000 m^3/day	2,800 m^3/day	-
BOD_5		80-300 mg/L	180 mg/L	504
COD		190-800 mg/L	460 mg/L	1288
Suspended Solids		5-80 mg/L	35 mg/L	98
Marimac Inc. (1987)				
Flow		NA	515 m^3/day	-
BOD_5		NA	135 mg/L	69.525
Suspended Solids		NA	30 mg/L	15.450
Dissolved Solids		NA	900 mg/L	463.5
Pfizer Canada Inc. (1987)	closed June, 1988			
Flow		-	450 m^3/day	-
BOD_5		10-712 mg/L	81.5 mg/L	36.675
Total Suspended Solids		10-2000 mg/L	125.67 mg/L	56.552
pH		7.09-9.52	8.06	-
BASF Canada Inc. (1990)	ceased large			
Flow	scale production	548-1342 m^3/day	899.25 m^3/day	-
COD	April 30, 1990	5-63 mg/L	22.66 mg/L	20.323
BOD_5		0.2-12 mg/L	3.39 mg/L	3.048
Suspended Solids		83-154 mg/L	105.82 mg/L	95.159
BASF Canada Inc. (1991)				
Flow		33-583 m^3/day	340.56 m^3/day	-
COD		12-118 mg/L	39.54 mg/L	13.466
BOD_5		1-7 mg/L	2.14 mg/L	0.729
Suspended Solids		33-583 mg/L	92.4 mg/L	31.468
Courtaulds Films Canada (August 1988)	closed October 6, 1989			
Acid Sewer				
Flow		3403-4680 m^3/day	4066 m_3/day	-
Acid Loss		-	-	4697
BOD_5		-	-	120.5
Suspended Solids		-	-	68.65
Sulphide Sewer				
Flow		1113-1296 m^3/day	1245 m^3/day	-
COD		219-1710 mg/L	412 mg/L	512.9
BOD_5		-	-	134
Suspended Solids		-	-	2.58
Storm Sewer				
Flow		1427.1-2016.3 m^3/day	1609.2 m^3/day	-
COD		188-404 mg/L	265 mg/L	.44
BOD_5		-	-	55

NA data not available

Pfizer Canada Inc.

Pfizer Canada Inc. made citric acid from tricalcium citrate treated with sulphuric acid. Its products were citric acid and waste gypsum ($CaCO_4$). Effluent was treated in a lagoon treatment facility before it was discharged to the City of Cornwall sanitary sewer. Pfizer Canada Inc. was closed in June 1988. Loadings of BOD_5 and total suspended solids are shown in Table 27.

BASF Canada Inc.

BASF Canada Inc. discontinued its production of industrial chemicals on April 30, 1990. However, they resumed small scale production of plasticizers such as phthalate compounds which give flexibility to plastics. Effluent currently discharges to the City of Cornwall sanitary sewer. Prior to discharge, BASF effluent undergoes secondary (biological) treatment. Loadings of BOD_5, COD and TSS are shown in Table 27. Average annual loading of suspended solids was high in both 1990 and 1991, at 95.159 kg/day and 31.468 kg/day respectively. Although there was a dramatic decrease over the two years, suspended solids loadings are still high and should be investigated.

Courtaulds Films Canada (formerly BCL Canada Inc.)

Courtaulds Films manufactured cellophane from viscose supplied by Courtaulds Fibres. Effluents were discharged through two sewers: (1) Courtaulds Films' acid sewer combined with the acid sewer from Courtaulds Fibres before discharging to the St. Lawrence River through a diffuser, and (2) a sulphide sewer combined with Courtaulds Fibres' alkaline sewer before discharging to the St. Lawrence River through a diffuser.

Courtaulds Films' maximum permissible acid discharge was exceeded in October and November, 1986 and in March 1987. In April and May of 1987, acid discharge equalled the maximum permissible amount (Environment Ontario Data Files, Cornwall Office). A Control Order issued to Courtaulds Films specified that process water discharged to the St. Lawrence River should not exceed a loading of 210 kg of sulphuric acid per tonne of production and 35 kg of BOD_5 per tonne of production. Acid and BOD_5 loading violations for 1988 and 1989 are listed in Table 28. The majority of sulphuric acid and BOD_5 violations occurred during the summer months of 1988 and 1989. The maximum BOD_5 violation occurred on October 12, 1988 with a loading of 527 kg/tonne of production. The maximum sulphuric acid violation was 311 kg/tonne of production on August 3, 1989. These 19 Control Order violations resulted in the closure of Courtaulds Films on October 6, 1989.

In September 1985, Environment Ontario monitored stack emissions at Courtaulds Films. Under normal operating conditions, concentrations of carbon disulphide (CS_2) and hydrogen sulphide (H_2S) averaged 501 mg/kg and 162 mg/kg, respectively. Emission loadings were estimated at 237 kg/hr for CS_2 and 34.3 kg/hr for H_2S. Atmospheric emissions of hydrogen sulphide were near or slightly above the permissible standard, and Environment Ontario sent a letter to Courtaulds Films (December 31, 1987) requesting that they improve the efficiency of their scrubber and monitor emissions.

Courtaulds Fibres

Courtaulds Fibres closed its Cornwall plant in November 1992. Since the closure occurred after this report was written, data for Courtaulds Fibres appears in other sections of this report.

Table 28. Sulphuric acid and BOD_5 loading (kg/tonne of production) violations by Courtaulds Films in 1988 and 1989 (Environment Ontario Data Files, Cornwall Office).

Date of Violation	Sulphuric Acid Loading (kg/tonne of production)	BOD_5 Loading (kg/tonne of production)
Loading requirement as specified by Control Order:	**210**	**35**
March 09, 1988	282	-
May 11, 1988	-	64.4
June 09, 1988	-	48.4
August 03, 1988	-	62.2
August 08, 1988	257	-
August 09, 1988	243	-
August 10, 1988	221	-
August 16, 1988	275	-
August 17, 1988	242	-
August 22, 1988	271	-
September 02, 1988	-	48.1
October 12, 1988	-	527.0
June 27, 1989	287	-
July 18, 1989	-	40.3
July 20, 1989	-	54.3
July 21, 1989	-	46.6
July 27, 1989	-	54.3
July 28, 1989	-	42.3
August 03, 1989	311	-

- No violation

8.13 Addendum to Section 7.4.1, Ontario

Air emissions (*i.e.*, of mercury, mercaptan and hydrogen sulphide) are regulated by the Ontario Point of Impingement calculations as stipulated under Regulation 308 for the Ontario Environmental Protection Act (EPA).

8.14 New Section 7.4.4, Federal Government

The Fisheries Act (either the sector-specific regulations/guidelines or the general provision (Section 36(3)) prohibiting the deposit of deleterious substances to fish habitat waters) applies to industries, municipalities and

all other dischargers in the St. Lawrence River AOC. The sector specific regulations and guidelines promulgated under *The Fisheries Act* and applicable to industries in this AOC are as follows:

- Pulp and Paper Effluent Regulations; and
- Chlor-Alkali Mercury Liquid Effluent Regulations.

Under *The Canadian Environmental Protection Act* (CEPA) there are currently three industry sector specific regulations which limit releases to the atmosphere. These regulations are:

- Vinyl Chloride Release Regulations;
- Chlor-alkali Mercury Release Regulations; and
- Secondary Lead Smelter Release Regulations.

The Chlor-alkali Mercury Release Regulation applies to ICI Forest Products in Cornwall and Environment Canada (Environmental Protection-Ontario Region) has been monitoring the compliance of this plant by conducting quarterly inspections and reviewing the required monitoring reports.

Under the Canadian Environmental Protection Act (CEPA), a systematic approach has been established to assess and control toxic substances in Canada. Forty-two Priority Substances comprising the Priority Substance List (PSL) are currently being assessed to determine their toxicity. If a substance is found to be toxic under the definition of CEPA, the Federal Minister of the Environment may regulate the life cycle of the substance, including the quantity of substance that may be manufactured, processed, used, discharged, offered for sale or sold in Canada. Assessments under the PSL must be completed within three years and the PSL is therefore updated every three years. Environment Canada aims to complete the assessments and implement controls, where required, for 100 toxic substances by the year 2000. Persistent toxic substances of concern in the Great Lakes (and in this Area of Concern) can be effectively controlled using the regulatory framework set up under CEPA.

The regional office of Environment Canada is responsible for ensuring compliance with Federal legislation in the province of Ontario. A formal federal-provincial administrative agreement does not currently exist for either *The Fisheries Act* (general prohibition Section 36(3), sector specific regulations and guidelines) or CEPA. In general, however, the provincial certificate of approval process allows for consideration of federal requirements covered under *The Fisheries Act*.

New Federal Pulp and Paper regulations were promulgated in June 1992. They regulate Domtar Fine Papers' effluent and require installation of secondary water treatment by 1995. Other regulations relating to the measurement of dioxins and furan precursors in brownstock defoamers and avoidance of PCP contaminated chips were also introduced.

8.15 New Section 7.4.5, Current Industrial Control Programs

Through the Ontario Ministry of the Environment MISA program, regulations passed under the Environmental Protection Act, require direct dischargers in the identified industrial sectors to monitor their effluents.

The first phase of the MISA program -- intensive monitoring of the industrial plant effluent streams for one year -- has been completed for all sectors. Reports on monitoring of the pulp and paper and the petroleum sectors have been issued. Domtar, Courtaulds Fibres, ICI Forest Products, Stanchem, Cornwall Chemicals, Morbern Inc. and Guardsman Chemicals were monitored by MISA. In the second phase, all the companies except Morbern Inc. and Guardsman Chemicals are required to continue a program of less intensive monitoring. The MISA monitoring program confirmed that Morbern Inc, a manufacturer of vinyl products, and Guardsman Chemicals, a manufacturer of industrial coatings and polyester resins, discharge only uncontaminated cooling water and will therefore face no further requirements under the MISA program.

Monitoring information and research by consultants and Environment Ontario on applicable wastewater control technology are being used as a basis to develop limits regulations. Limits regulations have been released for the petroleum sector, industrial minerals, metal mining, metal casting and the pulp and paper sectors. Organic chemical manufacturing, inorganic chemical, iron and steel, and electric power generating sector draft

regulations have been released for public consultation. (*Please note:* information in this paragraph only, has been updated to January 1995).

A Control Order was served to Domtar Specialty Fine Papers on January 9, 1990. The company must meet the requirements that Environment Ontario has set for its discharges of organochlorines (measured as AOX), total suspended solids and 5-day biochemical oxygen demand (BOD_5). The company exceeded the BOD_5 requirements shortly after the Order was served and was fined $40,000. The Control Order requirements have not been exceeded since this incident.

Courtaulds Fibres Canada was served with a Control Order to control spills on May 12, 1992. The Order required the company to install spill control measures and to devise and implement contingency and spill response plans. All of the spill control measures were installed well in advance of the deadlines.

9.0 REFERENCES

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APPENDIX I

Spill Occurrence Reports for Cornwall Industries, 1990-1992

(Ontario Ministry of Environment and Energy, Spills Action Centre)

The following codes are used in the report summary for spill occurrences *in 1991 only* :

CLEANUP
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number shown indicates estimated
percentage of spill cleaned up

IMPACT

C - confirmed impact

P - possible impact

N - impact not anticipated

01 - Human health or safety

02 - Fish kill

03 - Other kill

04 - Vegetation damage

05 - Groundwater pollution

06 - Surface water pollution

07 - Soil contamination

08 - Air pollution

09 - Multimedia pollution (any or all of 05, 06, 07, 08)

99 - Other impacts

Spills Occurrence Summary Reports, 1990-1992

COURTAULDS FIBRES, CORNWALL

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/90 to Dec. 31/90

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9000162	90/01/05 17:19	COURTAULDS - 1000L SODA SOLUTION (47%) TO ST LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT R HELLIAR ERP CONTACT
JOHN RITCHIE		P - Water course or lake	Closed? [N] SAC? [N]
9000288	90/01/09 16:59	COURTAULDS - 2 400 L ACID TO ST LAWRENCE FROM RETAINING TANK	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLAIR
JOHN RITCHIE		N -	Closed? [ ] SAC? [ ]
9000347	90/01/10 08:10	COURTAULDS - INCINERATOR DOWN. VENTED FUMES FOR 9.5 HRS	CORNWALL CITY CORNWALL DISTRICT R HELLIAR
JIM RENAHAN		P - Vegetation	Closed? [Y] SAC? [Y]
9000346	90/01/10 18:21	COURTAULDS - H2S AND CS2 FUMES TO AIR 1 HR.	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		-	Closed? [Y] SAC? [N]
9000380	90/01/11 17:00	COURTAULDS - INCINERATOR DOWN. VENTED FUMES FOR 8.5 HRS	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		-	Closed? [ ] SAC? [N]
9000383	90/01/11 18:28	COURTAULDS - 150 L SODIUM HYDROSULFIDE (45%) TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT J. COLUMBUS ERP CONTACT
LEO TASCA		P -	Closed? [N] SAC? [N]
9000472	90/01/15 03:59	COURTAULDS - INCINERATOR DOWN, EMITTING CS2 & H2S TO ATM.	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
NANCY RICHARDSON		-	Closed? [ ] SAC? [N]
9000486	90/01/15 11:14	BACKENTRY- COURTAULDS 450 LITRES NAOH (18%) TO SEWER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
DENIS GUIMOND		P -	Closed? [Y] SAC? [ ]
9000487	90/01/15 14:30	BACKENTRY- COURTAULDS 9000LITRES H2SO4(11.5%) TO SEWER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
DENIS GUIMOND		P -	Closed? [Y] SAC? [N]
9000598	90/01/17 18:42	COURTAULDS - INCINERATOR DOWN, EMITTED CS2 & H2S TO ATM.	CORNWALL CITY CORNWALL DISTRICT
CHRIS HIND		-	Closed? [ ] SAC? [N]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9000791	90/01/23 11:47	COURTAULDS INC. - 3600 L OF SULPHURIC ACID (10%) TO ST. LAWRENCE RIVER. - Water course or lake	CORNWALL CITY CORNWALL DISTRICT BOB HELLIAR Closed? [Y] SAC? [N]
BRIAN PARK			
9000975	90/01/28 23:13	COURTAULDS - CS2 AND H2S (TRACE AMOUNTS) TO AIR 8 HOURS. -	CORNWALL CITY CORNWALL DISTRICT Closed? [ ] SAC? [N]
LEO TASCA			
9001235	90/02/06 05:02	COURTAULDS - INCINERATOR IS DOWN.CS2, H2S TO AIR FOR 39 H. -	CORNWALL CITY CORNWALL DISTRICT Closed? [ ] SAC? [ ]
PEARL SHORE			
9001421	90/02/11 16:40	COURTAULDS-INCINERATOR DOWN-H2S AND CS2 TO ATMOSPHERE. -	CORNWALL CITY CORNWALL DISTRICT Closed? [ ] SAC? [ ]
CHRIS HIND			
9001761	90/02/20 13:30	COURTAULDS-3000 L SPINNING BATH ACID TO SEWER. -	CORNWALL CITY CORNWALL DISTRICT R.HELLIAR Closed? [ ] SAC? [ ]
CHRIS HIND			
9001936	90/02/24 04:00	COURTAULDS-54000L ACID TO ST. LAWRENCE R. OVER 14 H ON 90/02/16 -	CORNWALL CITY CORNWALL DISTRICT R.HELLIAR Closed? [N] SAC? [N]
NANCY RICHARDSON			
9002008	90/02/26 16:40	COURTAULDS - INCINERATOR DOWN. VENTED FUMES FOR 6.5 HRS P - Vegetation	CORNWALL CITY CORNWALL DISTRICT Closed? [Y] SAC? [Y]
LEO TASCA			
9002042	90/02/27 17:04	COURTAULDS-SPINNING ACID TO STORM SEWER. -	CORNWALL CITY CORNWALL DISTRICT R.HELLIAR Closed? [ ] SAC? [ ]
CHRIS HIND			
9002077	90/02/28 16:27	COURTAULDS -2500 LTR OF BATH ACID TO SEWERS. P -	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR Closed? [ ] SAC? [ ]
PEARL SHORE			
9002079	90/02/28 16:27	COURTAULDS - 450 LTR OF BATH ACID (11% H2SO4, 27% NA2SO4) TO SEWERS. P -	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR Closed? [ ] SAC? [N]
PEARL SHORE			
9002082	90/02/28 17:04	COURTAULD - FUME INCINERATOR DOWN FOR 2.5 HRS. -	CORNWALL CITY CORNWALL DISTRICT Closed? [ ] SAC? [N]
CHRIS HIND			

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9002749	90/02/28 18:30	COURTAULDS -2500 LTR OF BATH ACID TO SEWERS.	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
PEARL SHORE		P -	Closed? [ ] SAC? [N]
9002330	90/03/07 18:00	COURTAULDS-SPINNING ACID TO STORM SEWER.	CORNWALL CITY CORNWALL DISTRICT R HELLIAR
JIM RENAHAN		P - Water course or lake	Closed? [ ] SAC? [N]
9002448	90/03/10 20:38	COURTAULDS - LOST 18200 LTR OF SPIN BATH ACID TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT GERRY MURPHY ERP CALLOUT
PEARL SHORE		P - Water course or lake	Closed? [ ] SAC? [ ]
9002671	90/03/14 20:40	COURTAULDS - FUME INCINERATOR DOWN FOR DAYS	CORNWALL CITY CORNWALL DISTRICT
BRIAN PARK		N -	Closed? [Y] SAC? [Y]
9002985	90/03/21 20:45	COURTAULDS - 400 LTR. SPINNING ACID TO RIVER WHEN TANK OVERFLOWED.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
NANCY RICHARDSON		P - Fish kill	Closed? [N] SAC? [N]
9003530	90/04/06 16:10	COURTAULDS -100 LITRES OF 11% CAUSTIC SODA TO THE ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT R HELLIAR
BRIAN PARK		N -	Closed? [Y] SAC? [Y]
9003656	90/04/10 13:20	BACKENTRY-COURTAULDS - EST 1400 L. SPIN BATH ACID (3.3 % H2SO4 +)	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
DENIS GUIMOND		P - Water course or lake	Closed? [Y] SAC? [N]
9004327	90/04/25 20:20	COURTAULDS - TRACES OF H2S & CS2 EMITTED OVERNIGHT.	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
BRIAN PARK		P -	Closed? [Y] SAC? [Y]
9004682	90/05/02 06:23	COURTAULDS - 110 LTR OF 11% CAUSTIC SODA TO SEWER	CORNWALL CITY CORNWALL DISTRICT
PEARL SHORE		-	Closed? [ ] SAC? [ ]
9004828	90/05/04 22:03	COURTAULD'S- 500 LTR SPIN BATH ACID DISCHARGED TO STORM SEWERS	CORNWALL CITY CORNWALL DISTRICT
TOR RUSTAD		-	Closed? [ ] SAC? [ ]
9005032	90/05/09 09:35	BACK ENTRY - COURTAULDS - 9,000 L OF 34% SODIUM SULPHATE TO SEWER/RIVER.	CORNWALL TWP. CORNWALL DISTRICT R. HELLIAR
BRIAN PARK		P - Water course or lake	Closed? [ ] SAC? [N]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9005159	90/05/11 20:47	COURTAULDS INC. - 3,600 L OF SODIUM SULFATE TO THE ST. LAWRENCE R. VIA SEWER	CORNWALL CITY CORNWALL DISTRICT R HELLIAR
BRIAN PARK		N - Water course or lake	Closed? [N] SAC? [N]
9005201	90/05/13 08:55	COURTAULDS: 9,000L SPENT SPIN-ACID TO ST LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT LARRY BENOIT ERP CALLOUT
JOHN RITCHIE		P - Water course or lake	Closed? [N] SAC? [N]
9005506	90/05/19 04:30	COURTAULDS-300 L SPINNING BATH ACID TO ST. LAWRENCE RIVER 90/05/18	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
NANCY RICHARDSON		P -	Closed? [ ] SAC? [ ]
9005590	90/05/21 12:15	BACKENTRY-COURTAULDS - EST 1900 L. SPIN BATH ACID (3.3 % H2SO4 +)	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
DENIS GUIMOND		P - Water course or lake	Closed? [Y] SAC? [N]
9006169	90/05/31 16:45	COURTAULDS - 12,600 L OF SULFURIC ACID (75%) TO ST. LAWRENCE R. VIA SEWER	CORNWALL CITY CORNWALL DISTRICT MARC ROBERT
BRIAN PARK		P - Water course or lake	Closed? [Y] SAC? [N]
9006279	90/06/02 10:26	COURTAULDS?-YELLOW PLUME FROM OUTFALL.ONGOING.	CORNWALL CITY CORNWALL DISTRICT M. ROBERT ERP CALLOUT
NANCY RICHARDSON		P -	Closed? [ ] SAC? [ ]
9006282	90/06/02 10:26	COURTAULDS-100 L SODIUM SULFIDE TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT M. ROBERT
NANCY RICHARDSON		N -	Closed? [Y] SAC? [N]
9006338	90/06/03 14:20	COURTAULDS: 600L SPINNING ACID TO SEWER, RIVER	CORNWALL CITY CORNWALL DISTRICT MARC ROBERT ERP CONTACT
JOHN RITCHIE		P - Water course or lake	Closed? [N] SAC? [N]
9006401	90/06/05 04:10	COURTAULDS - 3000 L SPIN BATH LIQUOR TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT M. ROBERT ERP CONTACT
LEO TASCA		P -	Closed? [N] SAC? [N]
9006960	90/06/17 10:19	COURTAULDS-500 ML DESCALER TO ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
CHRIS HIND		P - Water course or lake	Closed? [Y] SAC? [ ]
9007276	90/06/23 05:40	COURTAULDS - APPROX. 600 LTR OF 17% CAUSTIC SOLN TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
DENIS GUIMOND		P - Water course or lake	Closed? [Y] SAC? [N]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9007331	90/06/24 05:00	BACKENTRY-COURTAULDS:700L SPINNING ACID TO RIVER VIA SEWER.	CORNWALL CITY CORNWALL DISTRICT R HELLIAR
DENIS GUIMOND		P - Water course or lake	Closed? [Y] SAC? [N]
9007402	90/06/25 22:46	COURTAULDS: 800L SODIUM SULFATE SOLUTION (45%) TO ST LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
JOHN RITCHIE		P - Water course or lake	Closed? [N] SAC? [N]
9007627	90/06/30 07:46	COURTAULDS-FUME INCINERATOR DOWN. CS2 AND H2S TO AIR	CORNWALL CITY CORNWALL DISTRICT RHEAL DELAQUIS ERP CONTACT
NANCY RICHARDSON		P - Human health	Closed? [ ] SAC? [ ]
9007658	90/07/01 01:55	COURTAULDS-900 L 45 % SODIUM SULFATE SLURRY TO ST. LAWRENCE R.	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
NANCY RICHARDSON		P - Water course or lake	Closed? [N] SAC? [ ]
9007839	90/07/05 09:00	COURTAULD'S-1500 LTR SPIN BATH ACID DISCHARGED TO STORM SEWERS	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
DENIS GUIMOND		P - Water course or lake	Closed? [ ] SAC? [N]
9007879	90/07/06 05:18	COURTAULDS CANADA -450 L. SPINNING ACID TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT R HELLIAR
GORD MCRAE		P - Water course or lake	Closed? [N] SAC? [ ]
9007912	90/07/06 19:54	COURTAULDS: 45 000L SPIN ACID TO ST LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT G.MURPHY ERP CALLOUT
JOHN RITCHIE		P - Water course or lake	Closed? [N] SAC? [N]
9007949	90/07/07 16:37	COURTAULDS - INCINERATOR DOWN DUE TO BEARING FAILURE.	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		P - Vegetation	Closed? [ ] SAC? [N]
9007977	90/07/08 11:35	BACKENTRY COURTAULDS 1000L SULPHURIC ACID TO GRAVEL.	CORNWALL CITY CORNWALL DISTRICT R.HELLIAR
CHRIS HIND		P - Groundwater pollution	Closed? [Y] SAC? [ ]
9008217	90/07/13 00:29	COURTAULDS - H2S & CS2 TO AIR OVERNIGHT DUE TO INCINERATOR MALFUNCTION.	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		P -	Closed? [ ] SAC? [ ]
9008497	90/07/19 06:16	COURTAULDS - 9000 L SPIN BATH ACID TO ST. LAWRENCE DUE TO OPERATOR ERROR.	CORNWALL CITY CORNWALL DISTRICT J. COLUMBUS ERP CALLOUT
LEO TASCA		P -	Closed? [Y] SAC? [Y]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9008546	90/07/19 21:12	COURTAULDS-UNKNOWN AMOUNT OF 17% CAUSTIC SOLN TO A LARGE GUTTER.	CORNWALL CITY CORNWALL DISTRICT JEFF COLUMBUS ERP CALLOUT
DENIS GUIMOND		N - Other	Closed? [ ] SAC? [N]
9008665	90/07/23 03:35	COURTAULDS - FUME INCINERATOR DOWN - H2S & CS2 TO ATMOSPHERE.	CORNWALL CITY CORNWALL DISTRICT
PEARL SHORE		N -	Closed? [ ] SAC? [ ]
9009001	90/07/29 14:55	COURTAULDS-375 L CAUSTIC WATER(1.3%) TO ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
CHRIS HIND		P - Water course or lake	Closed? [ ] SAC? [ ]
9009067	90/07/31 03:17	COURTAULDS: 230 LITRE OF EVAPORATED ACID TO ST LAWRENCE RIVER VIA SEWER	CORNWALL CITY CORNWALL DISTRICT KATRINA BENESCH
JOHN RITCHIE		P - Water course or lake	Closed? [Y] SAC? [Y]
9009288	90/08/04 10:04	COURTAULDS - INCINERATOR DOWN DUE TO ELECTRICAL PROBLEMS. H2S,C2S TO AIR	CORNWALL CITY CORNWALL DISTRICT HELLIAR,R.
LEO TASCA		P -	Closed? [Y] SAC? [N]
9009841	90/08/15 10:35	COURTAULDS - 1000L(10%) SPINNING ACID TO RIVER VIA ACID SEWER.	CORNWALL CITY CORNWALL DISTRICT ROB HELLIAR
DENIS GUIMOND		P - Water course or lake	Closed? [Y] SAC? [N]
9010332	90/08/25 07:20	COURTAULDS - FUME INCINERATOR DOWN 11 HRS (CS2 & H2S TRACES TO AIR)	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LEO TASCA		P -	Closed? [ ] SAC? [ ]
9010385	90/08/26 07:45	COURTAULDS - FUME INCINERATOR DOWN 10 HRS (CS2 & H2S TRACES TO AIR)	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LEO TASCA		P -	Closed? [ ] SAC? [N]
9010433	90/08/27 07:10	COURTAULDS - FUME INCINERATOR DOWN 10 HRS (CS2 & H2S TRACES TO AIR)	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LEO TASCA		P -	Closed? [ ] SAC? [N]
9010514	90/08/28 07:18	COURTAULDS - FUME INCINERATOR DOWN 10 HRS (CS2 & H2S TRACES TO AIR)	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LEO TASCA		P -	Closed? [ ] SAC? [N]
9010583	90/08/29 07:14	COURTAULDS - FUME INCINERATOR DOWN 10 HRS (CS2 & H2S TRACES TO AIR)	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LEO TASCA		P -	Closed? [ ] SAC? [Y]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9010641	90/08/30 07:20	COURTAULDS - FUME INCINERATOR DOWN 14 HRS (CS2 & H2S TRACES TO AIR)	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		P - Human health	Closed? [ ] SAC? [N]
9010938	90/09/06 07:01	COURTAULDS -INCINERATOR SHUT DOWN FOR TODAY FOR MAINTENACE.	CORNWALL CITY CORNWALL DISTRICT
PEARL SHORE		P - Vegetation	Closed? [ ] SAC? [ ]
9011113	90/09/10 10:43	BACKENTRY - COURTAULDS: 6 000 L SODIUM SULPHATE SLURRY TO RIVER.	CORNWALL CITY CORNWALL DISTRICT K BENESCH
PEARL SHORE		P - Water course or lake	Closed? [N] SAC? [N]
9011149	90/09/10 19:51	COURTAULDS-H2S & CS2 TO AIR FOR 10 H.	CORNWALL CITY CORNWALL DISTRICT
NANCY RICHARDSON		P - Vegetation	Closed? [ ] SAC? [ ]
9011301	90/09/13 21:13	BACKENTRY-COURTAULDS - 9,000 L. SODIUM HYDROXIDE (10%) TO ST. LAWRENCE R.	CORNWALL CITY CORNWALL DISTRICT R. HELLIAR
GORD MCRAE		P - Water course or lake	Closed? [N] SAC? [N]
9011328	90/09/14 23:50	COURTAULDS: 3 600 L SPENT SPIN BATH ACID TO ST LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT GERRY MURPHY ERP CONTACT
JOHN RITCHIE		P - Water course or lake	Closed? [Y] SAC? [Y]
9011379	90/09/15 09:06	COURTAULDS - FUME INCINERATOR DOWN H2S & CS2 TRACES EMITTED 12 HRS	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		P - Human health	Closed? [ ] SAC? [ ]
9011418	90/09/15 19:52	COURTAULDS - FUME INCINERATOR DOWN.H2S & CS2 TRACES EMITTED 12 HRS	CORNWALL CITY CORNWALL DISTRICT
NANCY RICHARDSON		P - Human health	Closed? [ ] SAC? [N]
9011609	90/09/19 20:50	COURTAULDS - FUME INCINERATOR DOWN H2S & CS2 TRACES EMITTED 13 HRS	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		P - Human health	Closed? [ ] SAC? [N]
9011885	90/09/26 16:05	COURTAULDS-FUME INCINERATOR DOWN.	CORNWALL CITY CORNWALL DISTRICT
CHRIS HIND		P - Human health	Closed? [ ] SAC? [ ]
9011962	90/09/28 04:54	COURTAULDS -2270 L. SPIN BATH ACID (10%) TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
GORD MCRAE		P - Water course or lake	Closed? [N] SAC? [N]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9011969	90/09/28 08:35	COURTAULDS: 450 LITRES OF SPIN ACID TO ST LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT R HELLIAR
JOHN RITCHIE		P - Water course or lake	Closed? [Y] SAC? [Y]
9012052	90/09/29 13:57	COURTAULDS -5000 L. SPIN BATH ACID (10% H2SO4) TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
JIM RENAHAN		P - Water course or lake	Closed? [ ] SAC? [N]
9012140	90/10/01 18:39	COURTAULDS-INCINERATOR DOWN.	CORNWALL CITY CORNWALL DISTRICT
CHRIS HIND		P - Human health	Closed? [ ] SAC? [ ]
9012574	90/10/11 23:40	COURTAULDS: 6 750 LITRES OF SPIN BATH ACID TO THE ST LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT MURPHY,G. ERP CALLOUT
JOHN RITCHIE		P - Water course or lake	Closed? [N] SAC? [N]
9012776	90/10/16 20:37	COURTAULDS-2500 L SPIN BATH ACID TO ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT R.DELAQUIS ERP CALLOUT
CHRIS HIND		P - Fish kill	Closed? [Y] SAC? [Y]
9013419	90/10/31 21:52	COURTAULDS - 450 L SPIN BATH LIQUOR TO STORM DRAIN.	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		P - Fish kill	Closed? [ ] SAC? [ ]
9013467	90/11/02 04:53	COURTAULD'S-675 L SPIN BATH ACID TO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT B. HELLIAR
NANCY RICHARDSON		N - Water course or lake	Closed? [N] SAC? [ ]
9013936	90/11/14 03:00	COURTAULDS -2300 L. OF 10% SPINNING ACID SOL'N TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT R. HELLIER
GORD MCRAE		P - Water course or lake	Closed? [N] SAC? [N]
TOTAL NUMBER OF SPILLS:			84.00

SPILLS ACTION CENTRE
SPILL SUMMARY REPORT

Spills by Courtaulds - Cornwall District
Jan. 01/91 to Dec. 31/91

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9100040		COURTAULDS -22700 L. 10%	.00pct	
	91/01/02	SPINNING ACID TO ST.		P 06
	91/01/02	LAWRENCE RIVER.		
9100329		COURTAULDS- 225L 10% SPIN	.00pct	
	91/01/11	INTO ACID SEWER FOR 1 HR		P 06
	91/01/11	FROM "RED SYSTEM BOX MIX"		
9100415		COURTAULDS-18,500 L	.00pct	
	91/01/14	SULPHIDE BATH LIQUOR TO		P 02
	91/01/11	ST. LAWRENCE RIVER.		
9100440		COURTAULDS-1100 LITERS	.00pct	
	91/01/15	10%SULFURIC ACID INTO A		P 06
	91/01/15	DRAIN & ST.LAWRENCE RIVER		
9100464		COURTAULDS-32 L 94%	.00pct	
	91/01/15	SULFURIC ACID TO DRAIN,		N
	91/01/15	TO ST. LAWRENCE RIVER		
9100546		COURTAULDS - 100 L 5%	.00pct	
	91/01/17	SODIUM SULFIDE TO RIVER		P 06
	91/01/17	DUE TO VALVE LEFT OPEN.		
9101201		COURTAULDS-225 LITRES OF	.00pct	
	91/02/08	SULFATES (2%) SOLUTION		P 06
	91/02/08	TO ST.LAWRENCE RIVER		
9101248		COURTAULD'S- 650L 10%	.00pct	
	91/02/10	SPIN BATH ACID DISCHARGED		P 06
	91/02/10	TO STORM SEWERS		

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9101315	91/02/12 91/02/12	COURTAULDS - 360 L OF SPIN ACID BATH TO THE ST. LAWRENCE RIVER.	.00pct	N
9101337	91/02/13 91/02/11	COURTAULDS-2000 L 10% SULPHURIC ACID TO ST. LAWRENCE RIVER.	.00pct	P 03
9101751	91/02/26 91/02/26	COURTALDS - 225 L. SODIUM SULPHATE SOLUTION INTO ST. LAWRENCE RIVER	.00pct	N 06
9101802	91/02/28 91/02/28	COURTAULDS - 450 L OF 13% BLEACH TO GROUND AND SEWER FROM LEAKY TANK.	75.00pct	N
9102007	91/03/05 91/03/05	COURTAULDS: 115L 94% SULPHURIC ACID OVERFLOW TO ST. LAWRENCE RIVER	.00pct	P 02
9102142	91/03/08 91/03/08	COURTAULDS: 900 LITRES SPINNING ACID TO RIVER DUE TO OPERATOR ERROR	.00pct	P 06
9102298	91/03/13 91/03/13	COURTAULDS-15 L TITANIUM OXIDE SOLUTION TO THE ST. LAWRENCE RIVER.	.00pct	P 06
9102353	91/03/14 91/03/14	COURTAULDS-11.3 M3 SPIN ACID TO SEWER AND RIVER, BROKEN DISCHARGE LINE	.00pct	P 06
9102357	91/03/14 91/03/14	COURTAULDS-900 LITRES OF SPIN BATH ACID TO SEWER AND ST.LAWRENCE RIVER	.00pct	P 06
9102723	91/03/24 91/03/24	COURTAULDS - 94% SULFURIC ACID TO GRAVEL & GRASS. HEADER CAME OFF TANK.	90.00pct	P 07
9103530	91/04/09 91/04/09	COURTAULDS - 1500 LTR SODIUM SULFATE SLURRY TO RIVER. PUMP SEAL BROKE.	.00pct	N 06

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9103638	91/04/10 91/04/10	COURTAULDS -860 L. 2% SODIUM SULPHIDE SOL'N TO ST. LAWRENCE RIVER.	.00pct	P 06
9104074	91/04/19 91/04/19	COURTAULDS-125 L SULPHURIC ACID TO THE ST. LAWRENCE RIVER	.00pct	P 02
9105280	91/05/14 91/05/14	COURTAULDS: 900L SPIN BATH ACID LEAK TO ST. LAWRENCE RIVER	.00pct	P 06
9105337	91/05/15 91/05/15	COURTAULDS: INCINERATOR SHUT-DOWN FOR 2.5 HRS	.00pct	N 99
9105532	91/05/19 91/05/19	COURTAULDS: GAS INCINERATOR OUT OF ORDER	.00pct	N
9105562	91/05/20 91/05/20	COURTAULDS-120 L.SPIN BATH ACID TO FLOOR AND ST.LAWRENCE RIVER	.00pct	P 06
9107615	91/06/24 91/03/14	BACKENTRY: COURTAULDS - 810 L ACID BATH SOLUTION TO ST. LAWRENC RIVER.	.00pct	P 06
9107653	91/06/24 91/06/24	COURTAULDS-550 LITRES OF SPIN BATH ACID TO DRAIN THEN ST.LAWRENCE RIVER	.00pct	P 06
9107644	91/06/24 91/06/24	COURTAULDS: 540 LITRES SODIUM SULPHATE TO ST. LAWRENCE RIVER	.00pct	N 06
9108037	91/07/02 91/07/02	COURTAULDS - 1200 L. OF SPIN BATH ACID TO THE ST. LAWRENCE RIVER	.00pct	P 06
9108720	91/07/14 91/07/14	COURTAULDS-9 M3 SODIUM SULFATE SOLUTION,50% SOLIDS TO ST.LAWRENCE R.		P 06

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9109287	91/07/24 91/07/24	COURTAULDS - 1980 L OF SPIN ACID AND SLUDGE TO THE ST. LAWRENCE RIVER.	.00pct	P 06
9109372	91/07/26 91/07/26	COURTAULDS -13,600 L. 10% SULPHURIC ACID TO ST. LAWRENCE.	.00pct	P 06
9109497	91/07/29 91/07/29	COURTAULDS - EST. 9,900L SPIN BATH ACID TO ST. LAWRENCE FROM MIX BOX.	.00pct	P 06
9109570	91/07/30 91/07/30	COURTAULDS - 1350 L OF SULPHURIC ACID (10 %) TO ST. LAWRENCE RIVER.	.00pct	N
9109784	91/08/04 91/08/04	COURTAULDS SYNTHETIC FIRBRES - 45 L. CAUSTIC SODA TO ST. LAWRENCE R.	.00pct	P 06
9110422	91/08/17 91/08/17	COURTAULDS - 675 L HOT STRETCH H20 (3% ACID) TO FLOOR, ST.SEWER & ST.LAW.	15.00pct	P 06
9110503	91/08/18 91/08/18	COURTAULDS-900L RECLAIMED ACID INTO ST. LAWRENCE RIVER -EQUIPMENT FAILURE.	.00pct	C 06
9110544	91/08/19 91/08/19	COURTAULDS -900 L. RECLAIM ACID TO THE ST. LAWRENCE RIVER.	.00pct	P 06
9110585	91/08/20 91/08/20	COURTAULDS - OFF-GASES TO ATMOSPHERE WHILE INCINERATOR DOWN 3.5 HRS.	.00pct	P 99
9111601	91/09/09 91/09/09	COURTAULDS - 450 L OF 30% SODIUM SULFATE TO THE ST. LAWRENCE R. FOR 25MIN	.00pct	N 06
9111898	91/09/14 91/09/14	COURTAULDS SYNTHETIC FIBRES- 22000 L. OF SPIN BATH ACID TO DIKED AREA	99.00pct	N

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9112338	91/09/23 91/09/23	COURTAULDS -900 L. 17% CAUSTIC SODA TO ST. LAWRENCE RIVER.	.00pct	P 06
9112550	91/09/29 91/09/29	COURTAULDS - 225 L MIXED ACID TO ST.LAWRENCE RIVER WHEN FLANGE BROKE ON LINE	.00pct	P 06
9112829	91/10/04 91/10/04	COURTAULDS - 500L 18.4% CAUSTIC SODA TO ST. LAWRENCE R., FAULTY SEAL.	.00pct	P 06
9113068	91/10/10 91/10/10	COURTAULDS-5.0 M3 SPIN BATH ACID TO FLOOR DRAIN ST.LAWRENCE RIVER.		P 06
9113500	91/10/22 91/10/22	COURTAULDS- 450 L RECLAIM ACID (H2SO4, ZNO, NA2SO4) TO ST. LAWRENCE RIVER.	.00pct	P 06
9113618	91/10/24 91/10/24	COURTAULDS -1300 L. SODIUM SULPHATE SOL'N TO ST. LAWRENCE RIVER	.00pct	P 06
9113959	91/11/02 91/11/01	COURTAULDS - UP TO 15,000 LTR OF 10% SULFURIC ACID TO RIVER.	.00pct	P 06
9114154	91/11/08 91/11/08	COURTAULDS: 6750 L SPIN-BATH LIQUOR TO RIVER WHEN FITTING WAS LEFT OPEN.	.00pct	P 06
9114165	91/11/08 91/11/08	COURTAULDS - 450 L OF 12% SULPHURIC ACID TO RIVER VIA SEWERS.	.00pct	P 06
9114222	91/11/10 91/11/10	COURTAULDS - APPROX. 32000 L. OF EVAPORATOR ACID TO ST. LAWRENCE	.00pct	P 06
9115005	91/12/02 91/12/02	COURTAULDS- 225L, 5-10% SODIUM SULPHIDE SOL'N TO ST.LAWRENCE R.,MECH.FAIL.	.00pct	P 06

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/91 to Dec. 14/92

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9100040	91/01/02 13:21	COURTAULDS -22700 L. 10% SPINNING ACID TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
GORD MCRAE		P - Water course or lake	Closed? [X] SAC? [Y]
9100329	91/01/11 21:37	COURTAULDS- 225L 10% SPIN INTO ACID SEWER FOR 1 HR FROM "RED SYSTEM BOX MIX"	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [Y]
9100415	91/01/14 14:00	COURTAULDS-18,500 L SULPHIDE BATH LIQUOR TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
CHRIS HIND		P - Fish kill	Closed? [X] SAC? [Y]
9100440	91/01/15 14:10	COURTAULDS-1100 LITERS 10%SULFURIC ACID INTO A DRAIN & ST.LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9100464	91/01/15 21:12	COURTAULDS-32 L 94% SULFURIC ACID TO DRAIN, TO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
NANCY RICHARDSON		N -	Closed? [X] SAC? [Y]
9100546	91/01/17 16:00	COURTAULDS - 100 L 5% SODIUM SULFIDE TO RIVER DUE TO VALVE LEFT OPEN.	CORNWALL CITY CORNWALL DISTRICT HELLIAR,R.
LEO TASCA		P - Water course or lake	Closed? [X] SAC? [Y]
9101201	91/02/08 22:33	COURTAULDS-225 LITRES OF SULFATES (2%) SOLUTION TO ST.LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9101248	91/02/10 09:40	COURTAULD'S- 650L 10% SPIN BATH ACID DISCHARGED TO STORM SEWERS	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR ERP CONTACT
STEVEN CARRASCO		P - Water course or lake	Closed? [X] SAC? [Y]
9101315	91/02/12 17:08	COURTAULDS - 360 L OF SPIN ACID BATH TO THE ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
BRIAN PARK		N -	Closed? [X] SAC? [Y]
9101337	91/02/13 10:26	COURTAULDS-2000 L 10% SULPHURIC ACID TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
CHRIS HIND		P - Other kill	Closed? [X] SAC? [Y]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9101751	91/02/26 18:25	COURTALDS - 225 L. SODIUM SULPHATE SOLUTION INTO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT BOB HELLIAR
JOHN SKRYPEK		N - Water course or lake	Closed? [X] SAC? [Y]
9101802	91/02/28 17:45	COURTAULDS - 450 L OF 13% BLEACH TO GROUND AND SEWER FROM LEAKY TANK.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
BRIAN PARK		N -	Closed? [X] SAC? [Y]
9102007	91/03/05 23:47	COURTAULDS: 115L 94% SULPHURIC ACID OVERFLOW TO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT ROBERT, M.. ERP CONTACT
STEVEN CARRASCO		P - Fish kill	Closed? [X] SAC? [Y]
9102142	91/03/08 15:50	COURTAULDS: 900 LITRES SPINNING ACID TO RIVER DUE TO OPERATOR ERROR	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN RITCHIE		P - Water course or lake	Closed? [X] SAC? [Y]
9102298	91/03/13 18:03	COURTAULDS-15 L TITANIUM OXIDE SOLUTION TO THE ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT GRANT, M.
CHRIS HIND		P - Water course or lake	Closed? [X] SAC? [Y]
9102353	91/03/14 21:14	COURTAULDS-11.3 M3 SPIN ACID TO SEWER AND RIVER, BROKEN DISCHARGE LINE	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR ERP CALLOUT
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9102357	91/03/14 23:14	COURTAULDS-900 LITRES OF SPIN BATH ACID TO SEWER AND ST.LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT R.HELLIAR
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9102723	91/03/24 01:40	COURTAULDS - 94% SULFURIC ACID TO GRAVEL & GRASS. HEADER CAME OFF TANK.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
KIM LENDVAY		P - Soil contamination	Closed? [X] SAC? [Y]
9103530	91/04/09 06:32	COURTAULDS - 1500 LTR SODIUM SULFATE SLURRY TO RIVER. PUMP SEAL BROKE.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
JIM RENAHAN		N - Water course or lake	Closed? [X] SAC? [Y]
9103638	91/04/10 16:28	COURTAULDS -860 L. 2% SODIUM SULPHIDE SOL'N TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
GORD MCRAE		P - Water course or lake	Closed? [X] SAC? [Y]
9104074	91/04/19 21:03	COURTAULDS-125 L SULPHURIC ACID TO THE ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
CHRIS HIND		P - Fish kill	Closed? [X] SAC? [Y]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9105280	91/05/14 15:54	COURTAULDS: 900L SPIN BATH ACID LEAK TO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
STEVEN CARRASCO		P - Water course or lake	Closed? [X] SAC? [Y]
9105337	91/05/15 16:35	COURTAULDS: INCINERATOR SHUT-DOWN FOR 2.5 HRS	CORNWALL CITY CORNWALL DISTRICT MARC ROBERT
JOHN RITCHIE		N - Other	Closed? [X] SAC? [Y]
9105532	91/05/19 14:20	COURTAULDS: GAS INCINERATOR OUT OF ORDER	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN RITCHIE		N -	Closed? [X] SAC? [Y]
9105562	91/05/20 11:20	COURTAULDS-120 L.SPIN BATH ACID TO FLOOR AND ST.LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9107615	91/06/24 11:09	BACKENTRY: COURTAULDS - 810 L ACID BATH SOLUTION TO ST. LAWRENC RIVER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LISA LOCKERBY		P - Water course or lake	Closed? [X] SAC? [Y]
9107644	91/06/24 20:55	COURTAULDS: 540 LITRES SODIUM SULPHATE TO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
JOHN RITCHIE		N - Water course or lake	Closed? [X] SAC? [Y]
9107653	91/06/24 23:43	COURTAULDS-550 LITRES OF SPIN BATH ACID TO DRAIN THEN ST.LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9108037	91/07/02 16:01	COURTAULDS - 1200 L. OF SPIN BATH ACID TO THE ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN SKRYPEK		P - Water course or lake	Closed? [X] SAC? [Y]
9108720	91/07/14 09:06	COURTAULDS-9 M3 SODIUM SULFATE SOLUTION,50% SOLIDS TO ST.LAWRENCE R.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9109287	91/07/24 09:15	COURTAULDS - 1980 L OF SPIN ACID AND SLUDGE TO THE ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
BRIAN PARK		P - Water course or lake	Closed? [X] SAC? [Y]
9109372	91/07/26 05:24	COURTAULDS -13,600 L. 10% SULPHURIC ACID TO ST. LAWRENCE.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
GORD MCRAE		P - Water course or lake	Closed? [X] SAC? [Y]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9109497	91/07/29 06:02	COURTAULDS - EST. 9,900L SPIN BATH ACID TO ST. LAWRENCE FROM MIX BOX.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [Y]
9109570	91/07/30 15:48	COURTAULDS - 1350 L OF SULPHURIC ACID (10 %) TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
BRIAN PARK		N -	Closed? [X] SAC? [Y]
9109784	91/08/04 08:14	COURTAULDS SYNTHETIC FIRBRES - 45 L. CAUSTIC SODA TO ST. LAWRENCE R.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN SKRYPEK		P - Water course or lake	Closed? [X] SAC? [Y]
9110422	91/08/17 14:25	COURTAULDS - 675 L HOT STRETCH H2O (3% ACID) TO FLOOR, ST.SEWER & ST.LAW.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [ ]
9110503	91/08/18 18:51	COURTAULDS-900L RECLAIMED ACID INTO ST. LAWRENCE RIVER -EQUIPMENT FAILURE.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
MICHEL CATTAN		C - Water course or lake	Closed? [X] SAC? [ ]
9110544	91/08/19 20:37	COURTAULDS -900 L. RECLAIM ACID TO THE ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
GORD MCRAE		P - Water course or lake	Closed? [X] SAC? [Y]
9110585	91/08/20 19:47	COURTAULDS - OFF-GASES TO ATMOSPHERE WHILE INCINERATOR DOWN 3.5 HRS.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
BRIAN PARK		P - Other	Closed? [X] SAC? [Y]
9111601	91/09/09 02:02	COURTAULDS - 450 L OF 30% SODIUM SULFATE TO THE ST. LAWRENCE R. FOR 25MIN	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
KIM LENDVAY		N - Water course or lake	Closed? [X] SAC? [Y]
9111898	91/09/14 12:40	COURTAULDS SYNTHETIC FIBRES- 22000 L. OF SPIN BATH ACID TO DIKED AREA	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN SKRYPEK		N -	Closed? [X] SAC? [Y]
9112338	91/09/23 10:53	COURTAULDS -900 L. 17% CAUSTIC SODA TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
GORD MCRAE		P - Water course or lake	Closed? [X] SAC? [Y]
9112550	91/09/29 08:52	COURTAULDS - 225 L MIXED ACID TO ST.LAWRENCE RIVER WHEN FLANGE BROKE ON LINE	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [Y]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9112829	91/10/04 18:00	COURTAULDS - 500L 18.4% CAUSTIC SODA TO ST. LAWRENCE R., FAULTY SEAL.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [Y]
9113068	91/10/10 18:12	COURTAULDS-5.0 M3 SPIN BATH ACID TO FLOOR DRAIN ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
PAUL WEBB		P - Water course or lake	Closed? [X] SAC? [Y]
9113500	91/10/22 04:38	COURTAULDS- 450 L RECLAIM ACID (H2SO4, ZNO, NA2SO4) TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [Y]
9113618	91/10/24 10:50	COURTAULDS -1300 L. SODIUM SULPHATE SOL'N TO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
GORD MCRAE		P - Water course or lake	Closed? [X] SAC? [Y]
9113959	91/11/02 01:05	COURTAULDS - UP TO 15,000 LTR OF 10% SULFURIC ACID TO RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JIM RENAHAN		P - Water course or lake	Closed? [X] SAC? [Y]
9114154	91/11/08 15:31	COURTAULDS: 6750 L SPIN-BATH LIQUOR TO RIVER WHEN FITTING WAS LEFT OPEN.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
LISA LOCKERBY		P - Surface Water Pollution	Closed? [X] SAC? [Y]
9114165	91/11/08 19:52	COURTAULDS - 450 L OF 12% SULPHURIC ACID TO RIVER VIA SEWERS.	CORNWALL CITY CORNWALL DISTRICT
BRIAN PARK		P - Water course or lake	Closed? [X] SAC? [Y]
9114222	91/11/10 21:40	COURTAULDS - APPROX. 32000 L. OF EVAPORATOR ACID TO ST. LAWRENCE	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN SKRYPEK		P - Water course or lake	Closed? [X] SAC? [Y]
9115005	91/12/02 03:41	COURTAULDS- 225L, 5-10% SODIUM SULPHIDE SOL'N TO ST.LAWRENCE R.,MECH.FAIL.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [Y]
9203157	92/04/07 09:30	COURTAULDS: 4.5 HRS H2S EMISSION TO ATM FROM #5 STACK DUE TO ERROR.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LISA LOCKERBY		P - Air Pollution	Closed? [X] SAC? [Y]
9204378	92/05/05 09:32	COURTAULDS FIBRES CANADA-110L SULPHURIC ACID FROM STORAGE TANK TO GRAVEL.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
MICHEL CATTAN		P - Soil Contamination	Closed? [ ] SAC? [ ]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9206055	92/06/10 05:16	COURTAULDS: 225L 11% CAUSTIC SODA OVERFLOW TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
STEVEN CARRASCO		P - Surface Water Pollution	Closed? [X] SAC? [Y]
9207937	92/07/18 10:23	COURTAULDS FIBRES - 2250L SPIN BATH ACID TO SEWER THEN ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
MICHEL CATTAN		P - Surface Water Pollution	Closed? [X] SAC? [ ]
9209663	92/08/29 03:09	COURTAULDS: 5000L SPIN ACID OVERFLOW TO STORM SEWER	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
STEVEN CARRASCO		P - Water course or lake	Closed? [X] SAC? [ ]
9210036	92/09/06 09:32	COURTAULDS-<10 LITERS 94% SULPHURIC ACID TO SEWER & ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
PAUL M WEBB		P - Water course or lake	Closed? [X] SAC? [ ]
9210067	92/09/07 08:06	COURTAULDS-340 LITERS OF 11% CAUSTIC SODA TO SEWER &ST LAWRENCE RIVER,ERROR.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
PAUL M WEBB		P - Water course or lake	Closed? [X] SAC? [ ]
9211268	92/10/02 17:23	COURTAULDS FIBRES - 1800L SPIN BATH ACID TO SEWER THEN ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
MICHEL CATTAN		P - Surface Water Pollution	Closed? [X] SAC? [N]
9211401	92/10/06 05:05	COURTAULDS - 25 TO 500 L 8% TITANIUM DIOXIDE TO RIVER FROM FAILED PUMP.	CORNWALL CITY CORNWALL DISTRICT
JIM RENAHAN		P - Water course or lake	Closed? [ ] SAC? [ ]
9212253	92/10/28 11:05	COURTAULDS CANADA - 110L SULPHURIC ACID FROM STORAGE TANK TO GRAVEL.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
KATHLEEN KLINCK		P - Soil Contamination	Closed? [X] SAC? [N]
9212397	92/11/02 05:45	COURTAULDS FIBRES CANADA: 9 000 L SODIUM SULPHATE SLURRY TO SEWER	CORNWALL CITY CORNWALL DISTRICT
JOHN RITCHIE		P - Water course or lake	Closed? [ ] SAC? [ ]
TOTAL NUMBER OF SPILLS:		63.00	

Spills Occurrence Summary Reports, 1990-1992

DOMTAR FINE PAPERS, CORNWALL

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/90 to Dec. 31/90

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9000479	90/01/02 09:00	BACKENTRY DOMTAR - ELEVATED CLAY LOSSES TO RIVER DURING CHRISTMAS SHUTDOWN	CORNWALL CITY CORNWALL DISTRICT R.HELLIAR
DENIS GUIMOND		P -	Closed? [Y] SAC? [N]
9001548	90/02/15 17:11	DOMTAR - 675 L OF BUNKER 'C' OIL TO DYKED CONTAINMENT AREA.	CORNWALL CITY CORNWALL DISTRICT
BRIAN PARK		N -	Closed? [Y] SAC? [N]
9001671	90/02/18 03:31	DOMTAR - 450 L OF BUNKER 'C' OIL TO DYKED CONTAINMENT AREA.	CORNWALL CITY CORNWALL DISTRICT BOB HELLIAR
DENIS GUIMOND		N -	Closed? [Y] SAC? [N]
9002511	90/03/12 09:01	DOMTAR-200 L SULFURIC ACID TO ST LAWRENCE R. (90/03/09)	CORNWALL CITY CORNWALL DISTRICT P. TAYLOR
NANCY RICHARDSON		N -	Closed? [ ] SAC? [ ]
9007758	90/07/03 17:03	DOMTAR-CHLORINE FIRE IN PLANT.	CORNWALL CITY CORNWALL DISTRICT
CHRIS HIND		P - Human health	Closed? [ ] SAC? [ ]
9008670	90/07/23 07:31	DOMTAR - BYPASSING UNTREATED EFFLUENT 2 HRS DUE TO ELEC. PROBLEM.	CORNWALL CITY CORNWALL DISTRICT
LEO TASCA		P -	Closed? [ ] SAC? [ ]
9008679	90/07/23 11:45	BACKENYTRY - DOMTAR; 21 TONNES S.S. RESULT OF HIGH FLOW FROM SPILL POND	RED ROCK TWP. THUNDER BAY DISTRICT H MORTFIELD
LISA LOCKERBY		P - Water course or lake	Closed? [ ] SAC? [N]
9010853	90/09/04 16:52	DOMTAR-HIGH SUSPENDED SOLIDS TO ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
CHRIS HIND		P - Water course or lake	Closed? [N] SAC? [ ]
9012889	90/10/19 01:40	DOMTAR - DIGESTOR GAS TO ATMOSPHERE FOR 4 HRS DUE TO STUCK VALVE.	CORNWALL CITY CORNWALL DISTRICT
JIM RENAHAN		P - Human health	Closed? [ ] SAC? [ ]
9013830	90/11/11 09:40	DOMTAR - 7500 LTR STARCH WITH 500 KG SOLIDS LOST WHEN GAUGE BLEW OFF PUMP.	CORNWALL CITY CORNWALL DISTRICT
JIM RENAHAN		P - Water course or lake	Closed? [Y] SAC? [ ]
TOTAL NUMBER OF SPILLS:		10.00	

SPILLS ACTION CENTRE
SPILL SUMMARY REPORT

Spills by Domtar - Cornwall District
Jan. 01/91 to Dec. 31/91

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9102301	91/03/13 91/03/12	BACKENTRY-DOMTAR-250 L BUNKER C OILTO GROUND.	100.00pct	C 07
9102633	91/03/21 91/03/21	DOMTAR: 225L BUNKER C OIL FROM TRANSFER LINE TO WOOD/ STYROFOAM AREA	99.00pct	N 07
9105549	91/05/20 91/05/19	DOMTAR - RAYOX (PAPER FILLER) TANK OVERFLOWED. ELEVATED T.S.S. TO RIVER.	.00pct	P 06
9106373	91/06/03 91/06/03	DOMTAR-TITANIUM DIOXIDE TO ST. LAWRENCE RIVER.	.00pct	P 06
9106735	91/06/09 91/06/09	DOMTAR - 100 L HYDRAULIC OIL TO SEWER AT MILL. RECOVERING FROM CLARIFIER	100.00pct	N
9107379	91/06/20 91/06/12	BACKENTRY: DOMTAR - 7275 KG COATING CLAY TO THE ST LAWRENCE RIVER.	.00pct	N
9109485	91/07/28 91/07/28	DOMTAR: 900 KG CAUSTIC SOLUTION DISCHARGED TO PLANT CLARIFIER, RIVER	.00pct	C 06
9109981	91/08/08 91/08/07	DOMTAR: CHLORINE GAS VENT TO ATMOSPHERE WHILE PRESSURIZING LINE	.00pct	N 99
9111151	91/09/01 91/09/01	DOMTAR - 1,350 L CLAY SLURRY TO CLARIFIER & ST. LAWRENCE RIVER.	.00pct	P 06

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9111406		DOMTAR FINE PAPERS-APPROX	.00pct	
	91/09/06	2000 L. OF COATING(HIGH		P 06
	91/09/06	SS) TO CLARIFIER		
9112307		DOMTAR -SUSPENDED CLAY IN	.00pct	
	91/09/22	PLANT EFFLUENT DISCHARGE		N 06
	91/09/22	TO ST. LAWRENCE RIVER.		
9115566		DOMTAR-160 L "BUSAN 1081	.00pct	
	91/12/18	BIO-CIDE" TO ST.LAWRENCE		P 06
	91/12/18	RIVER, DISCONECTED HOSE.		

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/91 to Dec. 14/92

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9102301	91/03/13 19:05	BACKENTRY-DOMTAR-250 L BUNKER C OILTO GROUND.	CORNWALL CITY CORNWALL DISTRICT MURPHY, G.
CHRIS HIND		C - Soil contamination	Closed? [ ] SAC? [ ]
9102633	91/03/21 12:39	DOMTAR: 225L BUNKER C OIL FROM TRANSFER LINE TO WOOD/ STYROFOAM AREA	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
STEVEN CARRASCO		N - Soil contamination	Closed? [X] SAC? [Y]
9105549	91/05/20 00:58	DOMTAR - RAYOX (PAPER FILLER) TANK OVERFLOWED. ELEVATED T.S.S. TO RIVER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
JIM RENAHAN		P - Water course or lake	Closed? [X] SAC? [Y]
9106373	91/06/03 11:20	DOMTAR-TITANIUM DIOXIDE TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
CHRIS HIND		P - Water course or lake	Closed? [X] SAC? [Y]
9106735	91/06/09 09:12	DOMTAR - 100 L HYDRAULIC OIL TO SEWER AT MILL. RECOVERING FROM CLARIFIER	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JIM RENAHAN		N -	Closed? [X] SAC? [Y]
9107379	91/06/20 13:14	BACKENTRY: DOMTAR - 7275 KG COATING CLAY TO THE ST LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
LISA LOCKERBY		N -	Closed? [X] SAC? [Y]
9109485	91/07/28 17:50	DOMTAR: 900 KG CAUSTIC SOLUTION DISCHARGED TO PLANT CLARIFIER, RIVER	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN RITCHIE		C - Surface Water Pollution	Closed? [X] SAC? [Y]
9111151	91/09/01 22:25	DOMTAR - 1,350 L CLAY SLURRY TO CLARIFIER & ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
KIM LENDVAY		P - Water course or lake	Closed? [X] SAC? [Y]
9111406	91/09/06 09:26	DOMTAR FINE PAPERS-APPROX 2000 L. OF COATING(HIGH SS) TO CLARIFIER	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN SKRYPEK		P - Water course or lake	Closed? [X] SAC? [Y]
9112307	91/09/22 11:16	DOMTAR -SUSPENDED CLAY IN PLANT EFFLUENT DISCHARGE TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
GORD MCRAE		N - Surface Water Pollution	Closed? [X] SAC? [Y]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9115566	91/12/18 11:13	DOMTAR-160 L "BUSAN 1081 BIO-CIDE" TO ST.LAWRENCE RIVER, DISCONECTED HOSE.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
PAUL WEBB		P - Surface Water Pollution	Closed? [X] SAC? [Y]
9200947	92/02/03 09:30	DOMTAR - 225 L HYDRAULIC OIL TO RIVER VIA SEWERS FROM SPILL IN PLANT.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
BRIAN PARK		N - Other	Closed? [X] SAC? [Y]
9200980	92/02/04 10:20	DOMTAR: SULPHUR DIOXIDE TO AIR FOR 45 MINUTES	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
JOHN RITCHIE		C - Air Pollution	Closed? [X] SAC? [Y]
9201803	92/02/29 23:45	DOMTAR-90 KG CHLORINE DIOXIDE TO MILL WATER, UNKNOWN QTY TO RIVER.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
PAUL WEBB		P - Other	Closed? [X] SAC? [Y]
9202070	92/03/09 12:00	DOMTAR-APPROX 17000L (48% CAUSTIC) TO SEWER, CLARI-FIER & ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
MICHEL CATTAN		P - Surface Water Pollution	Closed? [ ] SAC? [ ]
9202449	92/03/19 15:05	DOMTAR-615 L.HYDRAULIC OIL TO SEWER,CLAIRFIER THEN ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT
PAUL WEBB		P - Surface Water Pollution	Closed? [X] SAC? [Y]
9203477	92/04/16 06:42	DOMTAR-UNKNOWN QTY OF TITANIUM DIOXIDE TO THE ST.LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
PAUL WEBB		P - Surface Water Pollution	Closed? [X] SAC? [Y]
9206979	92/06/27 23:58	DOMTAR- 1755 L COATING MIXTURE OV/FLOWED TO GRND & SEWER TO CLARIFIER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
KIM LENDVAY		P - Surface Water Pollution	Closed? [X] SAC? [Y]
9207213	92/07/03 09:40	DOMTAR - 320 L OF HYDRAULIC FLUID TO STORM SEWER AND CLARIFIER	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
JOHN SKRYPEK		N -	Closed? [X] SAC? [Y]
9209527	92/08/26 23:40	DOMTAR INC. -HIGH SUSP. SOLIDS TO ST. LAWRENCE R.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
GORD MCRAE		N -	Closed? [X] SAC? [ ]
9209882	92/09/03 04:35	BACKENTRY-DOMTAR INC.: CLARIFIER EFFLUENT TO ST. LAWRENCE R.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
STEVEN CARRASCO		P - Water course or lake	Closed? [X] SAC? [N]

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9209941	92/09/04 07:05	DOMTAR INC. - 800 KG OF BLUE DYE TO ST. LAWRENCE RIVER	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
JOHN SKRYPEK		N -	Closed? [X] SAC? [ ]
9210499	92/09/15 16:52	DOMTAR INC -1350L COATING PAPER TO SEWER, CLARIFIER THEN ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
MICHEL CATTAN		N - Water course or lake	Closed? [X] SAC? [N]
9210748	92/09/21 02:45	DOMTAR INC: 2000-2400 L COATING MIXTURE O/FLOWED TO CLARIFIER & RIVER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
LISA LOCKERBY		P - Water course or lake	Closed? [X] SAC? [N]
9210789	92/09/21 20:20	DOMTAR INC - APPROX 0.5-1KG CHLORINE DIOXIDE GAS TO ATM.	CORNWALL CITY CORNWALL DISTRICT
MICHEL CATTAN		N -	Closed? [ ] SAC? [ ]
9211883	92/10/19 01:32	DOMTAR - 5400 L OF PRECIPITATED CALCIUM CARBONATE TO CLARIFIER	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
JOHN SKRYPEK		N -	Closed? [X] SAC? [ ]
TOTAL NUMBER OF SPILLS:			26.00

Spills Occurrence Summary Reports, 1990-1992

ICI FOREST PRODUCTS, CORNWALL

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/90 to Dec. 31/90

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9004966	90/05/07 17:05	I-C-I TRANSPORT TRUCK- 225 L HCL TO ROAD AND DITCH.	CORNWALL CITY CORNWALL DISTRICT R.DELAQUIS ERP CALLOUT
CHRIS HIND		N -	Closed? [Y] SAC? [ ]
9007986	90/07/08 13:27	BACKENTRY ICI-3.2 M3 WASTE WATER TO ST. LAWRENCE RIVER.	CORNWALL CITY CORNWALL DISTRICT M.ROBERT
CHRIS HIND		P - Water course or lake	Closed? [Y] SAC? [ ]
9013981	90/11/13 15:30	I-C-I FOREST PRODUCTS - 2025L BRINE TO RD & SEWER 2 PPM MERCURY.	CORNWALL CITY CORNWALL DISTRICT K.M.BENESCH
KIM LENDVAY		P - Water course or lake	Closed? [ ] SAC? [ ]

TOTAL NUMBER OF SPILLS: 3.00

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/90 to Dec. 31/90

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9000490	90/01/15 15:00	BACKENTRY - CIL- 2-2.5 KG HYDROGEN SULPHIDE TO ATM.	CORNWALL CITY CORNWALL DISTRICT ROBERT HELLIAR
DENIS GUIMOND		N -	Closed? [Y] SAC? [N]
9004403	90/04/27 10:11	BACKENTRY-CIL -3 KG. CHLORINE GAS TO ATM.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT
GORD MCRAE		N -	Closed? [Y] SAC? [Y]
9008721	90/07/24 00:10	I-C-I - HYDROGEN CHLORIDE AND SULFUR CHLORIDE TO ATMOSPHERE.	CORNWALL CITY CORNWALL DISTRICT
PEARL SHORE		P - Other	Closed? [ ] SAC? [ ]
TOTAL NUMBER OF SPILLS:			3.00

SPILLS ACTION CENTRE
SPILL SUMMARY REPORT

Spills by ICI Forest Products - Cornwall District
Jan. 01/91 to Dec. 31/91

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9101653	91/02/22 91/02/22	ICI: SODIUM HYDROSULPHIDE SPILL FROM TOP OF TANK TRUCK	50.00pct	N
9101892	91/03/02 91/03/02	ICI CANADA: SPILL OF EST. 100 L OF CARBON TETRACHLR TO FROZEN GRND - CLEANED	80.00pct	N
9113877	91/10/30 91/10/30	ICI: AQUEOUS AMMONIA LEAK FROM CONSOLIDATED PACKING UNIT.	.00pct	N

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT

Jan. 01/91 to Dec. 14/92

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9101653	91/02/22 15:33	I-C-I: SODIUM HYDROSULPHIDE SPILL FROM TOP OF TANK TRUCK	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT Closed? [X] SAC? [Y]
STEVEN CARRASCO		N -	
9101892	91/03/02 12:20	ICI CANADA: SPILL OF EST. 100 L OF CARBON TETRACHLR TO FROZEN GRND - CLEANED	CORNWALL CITY CORNWALL DISTRICT KATRINA COLUMBUS Closed? [X] SAC? [ ]
C. BERNATAVICIUS		N -	
9113877	91/10/30 19:20	ICI: AQUEOUS AMMONIA LEAK FROM CONSOLIDATED PACKING UNIT.	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT Closed? [X] SAC? [Y]
LISA LOCKERBY		N -	
9200629	92/01/23 14:09	I-C-I -CHLORINE GAS TO ATM. FROM TANK CAR, 1PPM CONC'N AT PLANT PROPERTY.	CORNWALL CITY CORNWALL DISTRICT RHEAL DELAQUIS Closed? [ ] SAC? [ ]
GORD MCRAE		N -	
9208145	92/07/31 03:38	ICI CANADA INC. -BRINE SOL'N TO GROUND AND STORM SEWER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR Closed? [ ] SAC? [N]
GORD MCRAE		P - Water course or lake	

TOTAL NUMBER OF SPILLS: 5.00

Spills Occurrence Summary Reports, 1990-1992

GUARDSMAN PRODUCTS, CORNWALL

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/90 to Dec. 31/90

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9002887	90/03/19 06:07	GUARDSMAN PRODUCTS - 500 - 800 KG OF POLY ESTER RESIN TO GRAVEL,CONTAINE -	CORNWALL CITY CORNWALL DISTRICT L COLUMBUS Closed? [Y] SAC? [Y]
PEARL SHORE			
9003950	90/04/18 19:35	GUARDSMAN PRODUCTS- 700 KG PAINT (UN 1263) SPILLED TO GROUND -	CORNWALL CITY CORNWALL DISTRICT Closed? [ ] SAC? [ ]
TOR RUSTAD			
9007458	90/06/27 06:06	BACKENTRY - GUARDSMAN PRODUCT- 200 L. DRUM OF SOLVEN SLUGE TO GROUND N -	CORNWALL CITY CORNWALL DISTRICT R. CHISHOLM Closed? [Y] SAC? [Y]
DENIS GUIMOND			
9008798	90/07/25 14:44	BACKENTRY - GUARDSMAN PRODUCT- 25L NAPHTHA OVER FLOWED FROM STORAGE TANK. P - Soil contamination	CORNWALL CITY CORNWALL DISTRICT MURRAY GRANT Closed? [Y] SAC? [X]
LISA LOCKERBY			
TOTAL NUMBER OF SPILLS:			4.00

SPILLS ACTION CENTRE
SPILL SUMMARY REPORT

Spills by Guardsman - Cornwall District
Jan. 01/91 to Dec. 31/91

SAC #	DATE	OCCURRENCE SYNOPSIS	CLEANUP	IMPACT
9107280		GUARDSMAN PRODUCTS - 1 T.	100.00pct	
	91/06/18	POLYESTER RESIN TO GRAVEL		N
	91/06/18	WHILE LOADING TANKER.		
9113125		GUARDSMAN PRODUCTS -RESIN	.00pct	
	91/10/12	WASTEWATER TO SAN. SEWER,		P 01
	91/10/11	ODOURS TO RESIDENCES.		

SPILLS ACTION CENTRE
SITE NAME SPILL SUMMARY REPORT
Jan. 01/91 to Dec. 14/92

SAC #	DATE/TIME	OCCURRENCE SYNOPSIS	LOCATION & MOE DISTRICT
9107280	91/06/18 22:45	GUARDSMAN PRODUCTS - 1 T. POLYESTER RESIN TO GRAVEL WHILE LOADING TANKER.	CORNWALL CITY CORNWALL DISTRICT PETER TAYLOR
JIM RENAHAN		N -	Closed? [X] SAC? [Y]
9113125	91/10/12 00:10	GUARDSMAN PRODUCTS -RESIN WASTEWATER TO SAN. SEWER, ODOURS TO RESIDENCES.	CORNWALL CITY CORNWALL DISTRICT GERRY MURPHY ERP CALLOUT
GORD MCRAE		P - Human health	Closed? [X] SAC? [Y]
9201902	92/03/04 15:40	GUARDSMAN PRODUCTS: 68 L PAINT TO GRND WHEN DRUM TIPPED OVER.	CORNWALL CITY CORNWALL DISTRICT MARC ROBERT
LISA LOCKERBY		N - Soil Contamination	Closed? [X] SAC? [Y]
9202073	92/03/09 14:25	GUARDSMAN PRODUCTS - 220-270L PAINT & VARSOL TO BACKYARD. CLEANED UP.	CORNWALL CITY CORNWALL DISTRICT MARC ROBERT
MICHEL CATTAN		C - Soil Contamination	Closed? [X] SAC? [Y]
TOTAL NUMBER OF SPILLS:			4.00